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JOURNAL

OF

SOUTH AFRICAN BOTANY

VOLUME XII.

SOME NEW SPECIES AND VARIETIES IN THE GENUS HAWORTHIA. V.

(With Plates I and II.)

By G. G. Smith.

Haworthia Schuldtiana var. **major** G. G. Smith. (Liliaceae-Aloineae.) Sect. Retusae.

Rosetta acaulescens, diam. 8½ cm.

Folia circiter 30, ascendentia, longa 39 mm., lata 12—13 mm.; *pars retusa* longa 18 mm., lata 10 mm., convexa, turgida, multis tuberculis prominentibus concoloribus albidis denticulatis ornata, pellucide viridis, lineisque 3(—7) albido-viridibus percursa, lineis 1—3 apicem prope attingentibus; *subtus* apicem versus tuberculis orbiculatis prominentibus albidis ornata.

Pedunculus simplex, diam. 2¼ mm., longus una cum racemo 30 cm., *pedicelli* longi 2½ mm.; *perianthium* opace ravo-albidum, longum 19 mm.; *ovarium* longum 3¾ mm., diam. 1½ mm., viride; *stylus* longus 1 mm., albido-viridis, flexus, capitatus.

Rosette acaulescent, up to 8½ cm. across.

Leaves up to 34, ascending, recurved, firm, 39 mm. long, 12—14 mm. broad below base of end-area, 9 mm. broad at base of leaf, 10½ mm. thick at base of end-area, obovate, acute, end-awn 2—4 mm. long, persistent;

KEY TO THE DRAWINGS.

F = Leaf face.
LS = Longitudinal section.
SB = Section near base.
INF = Inflorescence.
O & S = Ovary and Stamens.
C = Capsule.
B = Leaf back.
SM = Section near middle.
ST = Section near tip.
Del. M. C. L. = Drawn by Miss M. Courtenay-Latimer.

face below end-area convex, smooth below and with pellucid whitish mostly toothed spots near end-area, dark green to brownish-green, dull; *end-area* 18 mm. long, 12—14 mm. broad, convex, turgid, with many raised concolorous and whitish tubercles which are beset with white teeth, dark greenish pellucid, dull, with 3(—7) greenish-white ± converging

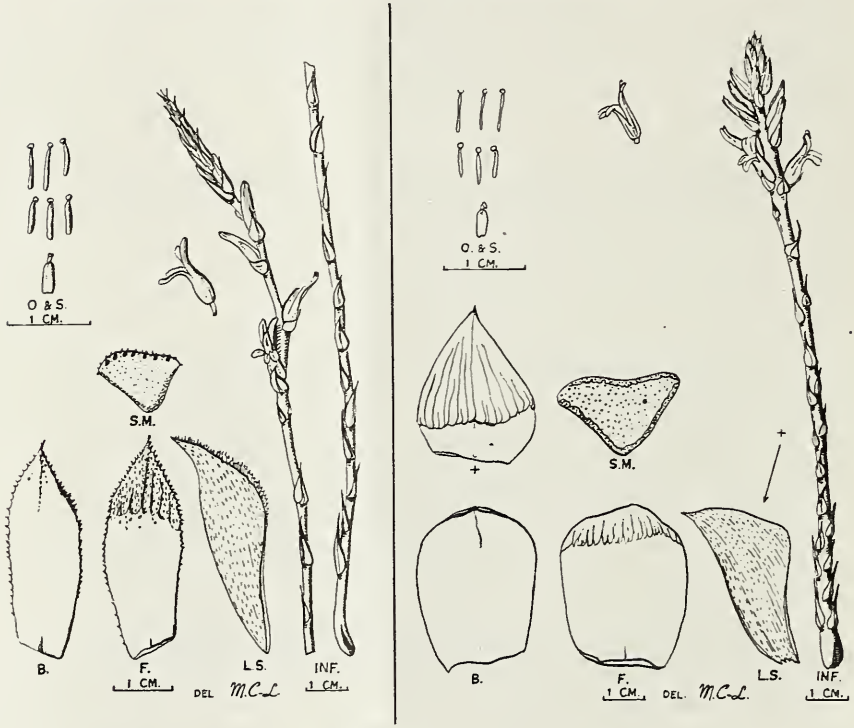


FIG. 1.

H. Schuldtiana var. *major.* *H. retusa* var. *multilineata.*

lines of which 1—3 nearly reach the tip; *back* convex, smooth below, beset with round raised whitish mostly toothed tubercles near tip, light green below, very dark green to dark brownish-green above, dull; *keel* 1—2, in the upper $\frac{3}{4}$, ± acute near tip, with $\frac{3}{4}$ mm. long whitish subulate teeth about $1\frac{1}{2}$ mm. apart; *margins* ± acute below, with 1 mm. long white subulate teeth about 1 mm. apart, becoming very short towards base of leaf.

Peduncle simple, terete, $2\frac{1}{4}$ mm. diam., 30 cm. long including the

raceme, greyish-brown below ; *raceme* 8½ cm. long, about 20 spirally arranged flowers and buds, 1 open at a time ; *pedicels* 2½ mm. long, 1—1¼ mm. elliptic, dark greyish-green ; *sterile bracts* 16, very large, 11½ mm. long, the lowest one 2 cm. from base of peduncle ; *fertile bracts* 10½ mm. long, deltoid acute-acuminate, white with a fine dark brown nerve ; *perianth* dull greyish-white, greyish-brown lined, 19 mm. long, the cylindrical-triangular sub-globose base 5 mm. diam., constricted to 2½ mm. above, ascending, curved, not stipitate ; *upper segments* obtuse, the outer ones replicate towards the tip, long recurved, ± spreading, face colour white with a broad greenish-brown nerve, the inner segment channelled, hardly recurved, much shorter, face colour white at tip, green below, with a medium-fine dark greenish-brown nerve ; *lower segments* obtuse, channelled, recurved about 75 degrees, the outer ones spreading, face colour white at tip, green below, the inner segment longer, face colour white with a medium fine greenish-brown nerve ; *stamens* 5½ and 6 mm. long ; *ovary* 3¾ mm. long, 1½ mm. diam., green ; *style* 1 mm. long, greenish-white, bent, capitate.

Habitat : Cape Province ; Riversdale Dist. (Type *G. G. Smith*, 5370, (*Dekenah* 9) in East London Museum Herb.).

Distribution : not further known.

This variety is described from material collected by Mr. J. Dekenah on the Karroo side of Garcia Pass, and sent to the Author in Oct.,1943. The plants grow tightly packed among rocks and in rock crevices on a northern aspect. Compared with *H. Schuldtiana* v.P. the plant is larger, much more heavily toothed and tubercled, and has a long end-awn.

Haworthia retusa var. **multilineata** G. G. Smith . (Liliaceae-Aloineae.) Sect. Retusae.

Rosetta acaulescens lata usque ad 8 cm.

Folia circiter 15, longa 49 mm., lata 29 mm. ; *pars retusa* longa 26 mm., lata 29 mm., deltoidea, acuta, lineis 16—22 longis brevibusque pallidissime viridibus percursa, apice seta longa 5 mm. ; *subtus* concava, laevia ; *carina* non denticulata ; *margines* parte inferiore minutissime denticulati.

Pedunculus simplex, diam. 2¾ mm., longus una cum racemo 16 cm., basi ravo-fuscus ; *pedicelli* longi ½ mm., virides ; *perianthium* opace album, longum 15½ mm. ; *ovarium* longum 3¼ mm., diam. 1⅛ mm., viride ; *stylus* longus ⅞ mm., opace albus, capitatus.

Rosette acaulescent, up to 8 cm. tall, not or slowly proliferous from the base.

Leaves 12—15, recurved, firm, 49 mm. long, 29 mm. broad and 17 mm. thick at the base of end area, end-awn about 5 mm. long, persistent; *face below end-area* flat at base, concave above, smooth, with fine longitudinal flecks, light greenish-brown ± mottled, dull: *end-area* 26 mm. long, 29 mm. broad, deltoid, acute, recurved at an angle of about 85 degrees, concave, turgid, beset with one or two raised concolorous tubercles, greenish-pellucid, the tip brownish-pellucid, ± shining, with about 16—22 long and short ± parallel very light green lines, the middle one reaching the tip, the others progressively shorter; *back* convex, smooth, with many longitudinal flecks, light green below, light reddish-brown then dark greenish-brown above to blackish brown at tip, dull, with about 8 broad lines alternating with fine ones; *keel* 1, acute near tip, naked; *margins* acute below, ± acute along the end-area, with very minute teeth in the lower half of leaf.

Peduncle simple, terete, $2\frac{3}{4}$ mm. diam., 16 cm. long including the raceme, greyish-brown towards the base of peduncle; *raceme* 5 cm. long, about 27 spirally arranged flowers and buds, 2 open simultaneously; *pedicels* $\frac{1}{2}$ mm. long (almost sessile), green; *sterile bracts* about 33, 12 mm. long, the lowest $\frac{3}{4}$ cm. from base of peduncle; *fertile bracts* 8 mm. long, deltoid, acuminate-subulate, white with a fine brown nerve; *perianth* dull white, $15\frac{1}{2}$ mm. long, the cylindrical-triangular base 4 mm. across, constricted to 3 mm. above, ascending, not or hardly curved; *upper segments* narrow obtuse, recurved about 80 degrees, channelled, face colour of the two outer segments dull white with a fine greenish-brown nerve, ± spreading, face colour of the inner one dull white at tip, greenish below, with a broad dull green nerve; *lower segments* narrow obtuse, channelled, recurved about 90 degrees, face colour of the two outer segments white at tip, green below with a broad dark green nerve, spreading, face colour of the inner one dull white with a fine green nerve; *stamens* 5 and 6 mm. long: *ovary* $3\frac{1}{4}$ mm. long, $1\frac{1}{8}$ mm. diam., green; *style* $\frac{7}{8}$ mm. long, dull white, bent, capitate.

Habitat: Cape Province: Riversdale Dist. (Type, *G. G. Smith* 5383, (*Dekenah* 83) in the East London Museum Herb.).

Distribution: not further known.

This attractive variety was collected by Mr. J. Dekenah in Dec., 1942, 2 miles north of Riversdale growing on a very dry stony hill facing east, in the open and under small bush. Compared with the species this plant is larger, has longer, broader and darker green leaves which are more retused, there are many more face lines on the end-area, and the margins and keel are entire except for very minute teeth on the margins on the lower half of the leaf.

Haworthia retusa var. **solitaria** G. G. Smith. (Liliaceae-Aloineae.)
Sect. Retusae.

Rosetta diam. 8 cm., a basi non (vel aegre) proliferans.

Folia 15 circiter, longa 40 mm., lata 21 mm., seta extrema persistente longa $4\frac{1}{2}$ mm. ornata ; *pars retusa* longa 21 mm., convexa, opace pellucide viridis, aspera, tuberculis parvis concoloribus lineisque 9—15 supra ornata ; *subtus* convexa, laevia, claro-viridia, apice obscure caeruleo-viridia ; *margines carinaque* plurimum denticulati.

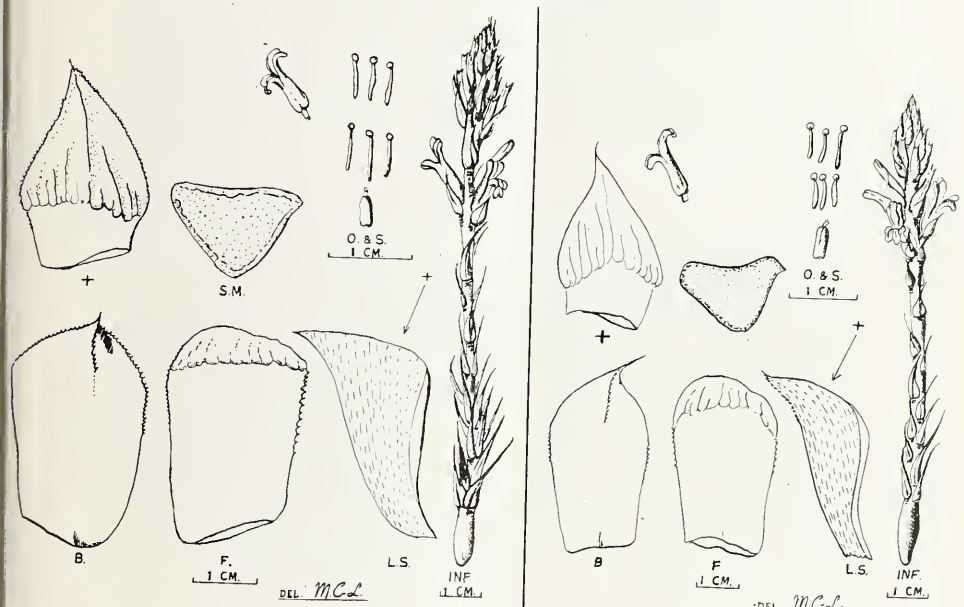


FIG. 2.

H. retusa var. *solitaria*. *H. retusa* var. *densiflora*.

Pedunculus simplex, diam. 4 mm., longus una cum racemo crebre floreato 14 cm. ; *pedicelli* longi 2 mm., diam. $1\frac{1}{2}$ mm. ; *bracteae steriles* 32 circiter ; *perianthium* albido-viride, longum 18 mm. ; *stamina* longa $5\frac{1}{2}$ and $6\frac{1}{2}$ mm. ; *ovarium* longum 4 mm., diam. 2 mm., viride ; *stylus* longus 1 mm., capitatus.

Rosette acaulescent, 8 cm. diam., not (or slowly) proliferous from the base.

Leaves about 15, the young erect, the old ascending, recurved, firm, 40 mm. long, 21 mm. broad and 14½ mm. thick at the base of end-area, with a distinct 4½ mm. long whitish naked persistent end-awn ; *face below end-area* ± flat below, concave above, smooth, with very pale papillae, light green, not shining ; *end-area* 21 mm. long, 22 mm. broad, convex, turgid, deltoid acute (—acuminate), rough with small concolorous tubercles, dark pellucid green, ± shining, retused at an angle of about 90 degrees, with 9—15 ± parallel lines, the middle one reaching or nearly reaching the tip, the others progressively shorter ; *back* convex, smooth, light green, dark bluish-green at tip, dull ; *keel* 1, in the upper ⅓, acute near tip, with many ¾ mm. long teeth which are green below and pellucid near tip, ¾ mm. apart ; *margins* acute below, ± rounded above, dark green above, light green below, the reflexed teeth green below and pellucid near tip.

Peduncle simple, terete, 4 mm. diam., 14 cm. long including the aggregate cylindric-conic raceme, brown towards the lower end ; *raceme* up to 5½ cm. long, about 35 spirally arranged flowers and buds, 2 open simultaneously ; *pedicels* 2 mm. long, 1½ mm. diam., dark green ; *sterile bracts* about 32, 15 mm. long, the lowest 1 cm. from base of peduncle ; *fertile bracts* 12 mm. long, deltoid, long acuminate, white with a fine dark brown nerve ; *perianth* greenish-white, 18 mm. long, the cylindrical-triangular base 5 mm. across, constricted to 3 mm. above, ascending, curved ; *upper segments* channelled, recurved at an angle of 90 degrees, face colour of the inner segment pinkish-green with a broad green nerve, broad, short, face colour of the 2 outer pinkish-white with a broad dark green nerve, narrower, acute, longer and ± spreading ; *lower segments* acuminate, recurved about 90 degrees, face colour of the inner segment pinkish-white with a fine green nerve, channelled, broad, face colour of the 2 outer white with a broad green nerve, narrower, replicate, spreading ; *stamens* 5½ and 6½ mm. long ; *ovary* 4 mm. long, 2 mm. diam., green ; *style* 1 mm. long, bent, capitate.

Habitat : Cape Province ; Riversdale District. (Type *G. G. Smith* 5373, (*Dekenah* 5) in the East London Museum Herbarium).

Distribution : not further known.

This variety is described from material sent to the author by Mr. J. Dekenah of Riversdale, in Oct., 1942. It occurs about 6 miles north of Riversdale on the Corrente River, growing amongst rocks and practically covered with turf. The plants grow flat, with the retused surface level with the ground, and although found in dense patches, they are all single. Mr. Dekenah writes, " I have found no plants with suckers." Compared with the species, this variety has a long persistent end-awn, the end-area is rough with small concolorous tubercles, has more face lines, the margins

and keel have many small teeth and the peduncle is much thicker and with a short dense raceme.

Haworthia retusa var. **densiflora** G. G. Smith. (Liliaceae-Aloineae.) Sect. Retusae.

Rosetta acaulescens, lata usque ad 9 cm.

Folia circiter 16, longa 45 mm., lata 23 mm. ; *pars retusa* longa 24 mm., lata 23½ mm., tuberculis compluribus parvis prominentibus concoloribus ornata, lineisque circiter 11 longis brevisbusque claro-viridibus percursa ; *subtus* laevia, basim versus claro-viridia, apicem versus pulliora, opaca; *seta extrema* longa 6 mm., nuda, persistens ; *carina marginesque* denticulati.

Pedunculus diam. 3 mm., longus una cum racemo 12½ cm., basi claro-fuscus ; *pedicelli* longi 1 mm., obscure virides ; *perianthium* album, longum 17 mm. ; *ovarium* longum 4 mm., diam. 1¾ mm., viride ; *stylus* longus ¾ mm., albus, capitatus.

Rosette acaulescent, up to 9 cm. across.

Leaves about 16, the young erect, the old spreading, recurved, firm, 45 mm. long, 23 mm. broad and 14 mm. thick at base of end-area ; *face below end-area* ± flat at base, concave above, ± smooth or with a few small raised concolorous tubercles below base of end-area on some leaves, light green, dull ; *end-area* 24 mm. long, 23 mm. wide, convex, ± turgid, with a number of small raised concolorous tubercles and about 11 long and short light green ± converging lines, the middle one nearly reaching the tip, the others progressively shorter, deltoid, acuminate, light pellucid green, shining, the older leaves retused at an angle of about 90 degrees ; *back* convex, smooth, light green below, darker green above, dull ; *end-awn* 6 mm. long, naked, persistent, reddish-brown at base, light brown at middle to dull white at tip ; *keel* central, 1 in the upper ⅓, ± acute, with many very fine greenish-pellucid deltoid teeth in the upper ½ ; *margins* ± acute, with many larger greenish-pellucid deltoid teeth in the lower half, entire above or with very small teeth.

Peduncle simple, terete, 3 mm. diam., 12½ cm. long including the aggregate cylindric-conic raceme, light brown towards the lower end ; *raceme* 4½ cm. long, about 30 spirally arranged flowers and buds, 2 open simultaneously ; *pedicels* 1 mm. long, 1—1½ mm. elliptic, dark green ; *sterile bracts* about 29, 18 mm. long, the lowest 1 cm. from base of peduncle ; *fertile bracts* 9 mm. long, deltoid, subulate, white with a fine reddish-brown nerve ; *perianth* white, 17 mm. long, the cylindrical-triangular base 5 mm. across, constricted to 3½ mm. above, ascending, straight, not stipitate ; *upper segments* recurved about 90 degrees, channelled, face colour of the inner one white with a broad green nerve,

narrow obtuse, face colour of the 2 outer white with a fine greenish-brown nerve, ± acute, ± spreading ; *lower segments* more recurved, face colour of the inner one white with a fine greenish-brown nerve, channelled, narrow obtuse, face colour of the two outer ones white with a broad green nerve, deeply channelled to replicate, acute, spreading ; *stamens* 5 and 6 mm. long ; *ovary* 4 mm. long, $1\frac{3}{4}$ mm. diam., green ; *style* $\frac{3}{4}$ mm. long, white, bent, capitate.

Habitat : Cape Province ; Riversdale Dist. (Type *G. G. Smith*, 5056 (*Venter* 106) in the East London Museum Herbarium).

Distribution : This variety was collected by Lt.-Col. H. Venter in the Riversdale Dist., and sent to the author in May, 1941. It is nearest to *H. retusa* var. *solitaria* G. G. Smith, but is a larger and taller growing plant, the leaves are somewhat less retused, and the end-awn is longer.

Haworthia mundula G. G. Smith. (Liliaceae-Aloineae.) Sect. Retusae

Rosetta acaulescens, a basi proliferans.

Folia longa 38 mm., lata 13 mm. : *pars retusa* longa 17 mm., laevis vel paucis tuberculis parvis prominentibus concoloribus ornata, lineisque longis 1—3, brevibus 5 pallide viridibus percursa : *margines* dentibus longis $\frac{1}{2}$ mm., ± prominentibus albido-viridibus, retrorsis ornati.

Pedunculus simplex, diam. 1 mm., longus una cum racemo 16 cm. ; *pedicelli* longi 2 mm., fusco-virides ; *bracteae steriles* 12, longae 6 mm. ; *bracteae fertiles* longae 4 mm. ; *perianthium* opace album, longum 17 mm. ; *ovarium* longum 3 mm., diam. $1\frac{1}{3}$ mm., viride : *stylus* longus $\frac{1}{2}$ mm., opace albus, inflexus, ± capitatus.

Rosette acaulescent, 60 mm. diam., freely proliferous from the base.

Leaves about 16, the young erect, the old spreading, recurved, ± incurved near tip, firm, 38 mm. long, 13 mm. broad and 10 mm. thick at base of end-area, 14 mm. broad below, oblong, acute ; *end-awn* 3 mm. long, naked, mostly deciduous, brownish-white ; *face below end-area* flat towards base, ± convex above, smooth, pale green below, dark green above, dull ; *end-area* acute, 17 mm. long, 13 mm. broad, convex, smooth or with a few small raised concolorous tubercles in 1—2 longitudinal rows, retused at an angle of about 70 degrees, greenish-pellucid, ± shining, with 1—3 long and about 5 short pale green lines, the middle one nearly reaching the tip, the others becoming shorter ; *back* convex, ± triangular near tip, smooth, beset with very minute whitish longitudinal flecks in the lower half, light green below, dark green above, dull, with about 12 longitudinal lines ; *keel* 1, in the upper $\frac{1}{3}$, acute, with $\frac{1}{2}$ mm. long, acute, pellucid-green teeth ; *margins* acute, whitish pellucid below, with ± prominent greenish-white $\frac{1}{2}$ mm. long retrorse acute-acuminate teeth which become smaller near the base of leaf.

Peduncle simple, terete, 1 mm. diam., 16 cm. long including the raceme, greenish-brown below ; *raceme* 6 cm. long, about 8 spirally arranged flowers and buds, 1—2 open simultaneously ; *pedicels* 2 mm. long, $\frac{3}{4}$ by 1 mm. elliptic, greenish-brown ; *sterile bracts* 12, 6 mm. long, the lowest about 1 cm. from base of peduncle ; *fertile bracts* 4 mm. long, ovate, acuminate, white with a medium-fine dark brown nerve ; *perianth* dull white, 17 mm. long, the cylindrical-triangular base 3 mm. across, constricted to $2\frac{1}{4}$ mm. above, erect ± ascending, curved ; *upper segments* obtuse, the outer ones ± replicate, recurved, spreading, face colour dull

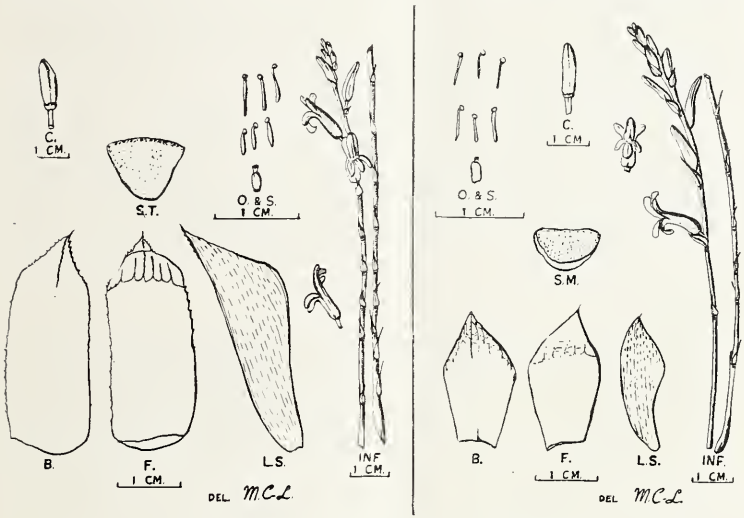


FIG. 3.

H. mundula. *H. turgida* var. *pallidifolia.*

pinkish-white with a medium-fine dark green nerve, the inner segment channelled, recurved, face colour dull pinkish-white towards tip, green below with a fine dark green nerve ; *lower segments* obtuse, the inner one very recurved, channelled, face colour dull white with a fine dark green nerve, the outer segments replicate, ± revolute, spreading, face colour dull pinkish-white below, green above, with a fine dark green nerve ; *stamens* 5 and 6 mm. long ; *ovary* 3 mm. long, $1\frac{1}{3}$ mm. diam., green ; *style* $\frac{1}{2}$ mm. long, dull white, bent, ± capitate.

Habitat : Cape Province : Bredasdorp Dist. (Type *G. G. Smith*, 5479 (*Otzen* 10) in East London Museum Herbarium.)

Distribution : not further known.

This neat little plant is described from material collected by Mr. M. Otzen in Dec., 1942, some miles west of Bredasdorp, from which district it has been recorded by several collectors. It is nearest to *H. mirabilis* Haw. in its clear pellucid end-area, but in the new species the end-area is shorter and less pointed, there are no tubercles on back of leaves and the end-awn is shorter.

Haworthia turgida var. **pallidifolia** G. G. Smith. (Liliaceae-Aloineae.) Sect. Retusae.

Folia 25 circiter, longa usque ad 27 mm., lata 12 mm., obovata, deltoidea, acuta ; *parte retusa* longa 10—11 mm., lata 12 mm., convexa, laevia, lineis longis 3 brevibusque 3—4 percursa ; *subtus* convexa, laevia, claro-viridia ; *carina marginesque* integri.

Pedunculus diam. vix 1 mm., longus una cum racemo 20 cm. ; *pedicelli* longi 1¾ mm., diam. 1 mm., obscure virides ; *bracteae steriles* 8—9, longae 4 mm. ; *bracteae fertiles* longae 5½ mm. ; *perianthium* album, longum 16 mm., basi cylindrico-triquetra diam. 3½ mm. ; *ovarium* longum 2½ mm., diam. 1¼ mm., viride ; *stylus* longus ½ mm.

Rosette acaulescent, 4 cm. diam., proliferous from the base and forming clusters.

Leaves about 25, the young erect, the old erect-spreading, ± firm, up to 27 mm. long, 12 mm. broad, 7 mm. thick at base of end-area, obovate, deltoid-acute ; *end-awn* 1½ mm. long, naked, persistent, pale green ; *face below end-area* ± convex, smooth, with minute longitudinally oblong flecks, light green, dull ; *end-area* 10—11 mm. long, 12 mm. broad, convex, smooth, light pellucid green, dull, with minute longitudinally oblong lighter to silvery flecks and 3 long lines, one of which reaches the tip, and 3—4 short lines extending only slightly into the pellucid part, the lines distinctly reticulate ; *back* convex, smooth, light green, dull, with many oblong pellucid spots and longitudinally oblong lighter flecks, and about 12 reticulate lines ; *keel* obliquely arranged in the upper ¼, entire ; *margins* rounded above, ± acute below, entire.

Peduncle simple, terete, barely 1 mm. diam., 20 cm. long including the few flowered raceme, light brown to light greenish-brown below ; *raceme* 5½ cm. long, about 12—14 spirally arranged flowers and buds, 1—2 open simultaneously ; *pedicels* 1¾ mm. long, 1 mm. diam., dark green ; *sterile bracts* 8—9, 4 mm. long, the lowest 2 cm. from base of peduncle ; *fertile bracts* 5½ mm. long, deltoid, acuminate, white, with a medium-fine brown nerve ; *perianth* white, 16 mm. long, the cylindrical-triangular base 3½ mm. across, tapering to 2¾ mm. above, not stipitate, oblong-ovate, ascending-spreading, curved ; *upper segments* obtuse, channelled, face

colour white with a fine green nerve, the 2 outer segments recurved, spreading, the inner one less recurved, shorter ; *lower segments* obtuse, channelled, face colour white near tip, light green below, with a broad darker green nerve, the outer ones recurved about 90 degrees, the inner one very recurved, longer ; *stamens* 4½ and 4 mm. long ; *ovary* 2½ mm. long, 1¼ mm. diam., green ; *style* ½ mm. long, white, bent, capitate ; *capsule* 12 mm. long, 3—3½ mm. diam., oblong.

Habitat : Cape Province : Riversdale Dist. (Type *G. G. Smith* 5714, (*Dekenah* 146), in East London Museum Herbarium.)

Distribution : not further known.

This distinctive variety is described from material collected by Mr. J. Dekenah of Riversdale, on the Valsch River, and sent to the author in May, 1944. It is easily grown and soon forms neat clusters. Compared with the species the leaves are longer, broader, thicker and more acute, and have a 1½ mm. long end-awn. The flecks on the end-area are more numerous, the lines on the back are more conspicuous, those on the face are fewer and less defined and are not as reticulate. In colour, this variety is a lighter green than any other plant so far recorded in the Retusae Section.

Haworthia asperiuscula var. **patagiata** G. G. Smith. (Liliaceae-Aloineae.) Sect. Trifariae.

Caulis foliatus erectus, longus usque ad 15 cm., latus una cum foliis 25 mm., a basi proliferans.

Folia ordinate trifaria, imbricata, divergentia, longa 20 mm., lata 13—15 mm. ; *supra* concava, parte superiore minute scabrosa, claro-fulvido-viridia, apicem versus obscure viridia ; *subtus* convexa, partibus duabus superioribus minute scabrosa, obscure viridia, opaca.

Pedunculus simplex, diam. 1 mm., longus una cum racemo 28 cm., basim versus fuscus ; *pedicelli* longi 7 mm., viride-fusci ; *bracteae fertiles* longae 3½ mm. ; *ovarium* longum 3 mm., 1⅓ mm. diam. ; *stylus* longus 2 mm.

Leafy stem erect, up to 15 cm. long, 25—28 mm. across including the leaves, proliferous from the base and forming clusters.

Leaves regularly trifarious, imbricated, spreading, recurved, 20 mm. long, 13—15 mm. broad above the base, 4½ mm. thick at the middle, the sheathing leaf base 6½—7½ mm. long on the side opposite to the lamina, ovate-deltoid, ± abruptly acuminate, cuspidate ; *face* concave, triangular-concave towards the tip, minutely scabrous in the upper half with concolorous papillae, often with a longitudinal concolorous raised line alongside the middle groove, pink at base, light yellowish-green becoming dark

green towards the tip, ± shining below to dull above ; *back* rounded, becoming triangular towards the tip, minutely scabrous in the upper $\frac{2}{3}$, sandy, pink at base, dark green above, dull ; *keel* prominent, straight and central in the upper $\frac{1}{3}$, below turned sharply to one side in a long curve, green, horny, ± shining ; *margins* acute below, becoming broad and flattened towards the tip of leaf, green, horny, shining.

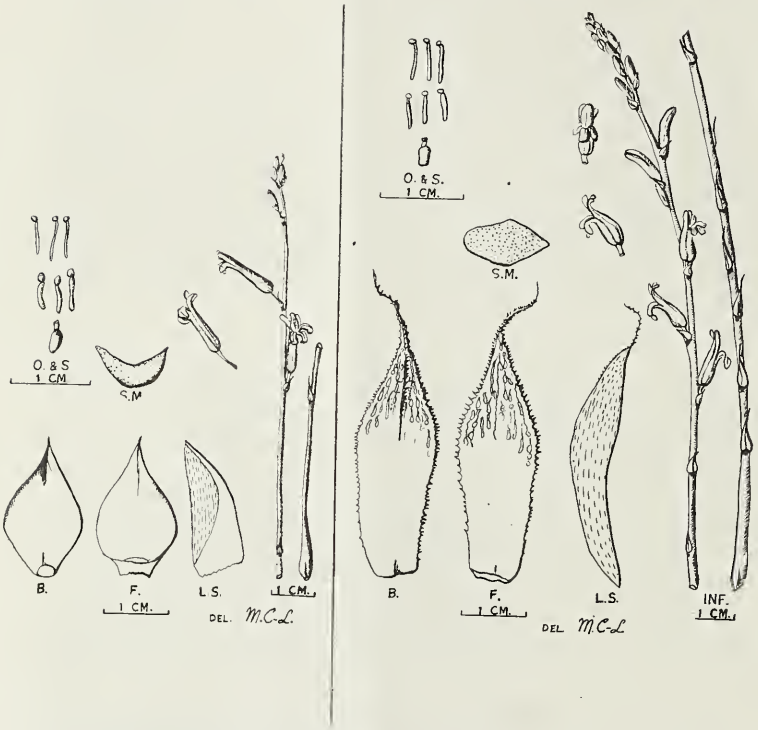


FIG. 4.

H. asperiuscula var. *patagiata*. *H. Nort'eri*.

Peduncle simple, terete, 1 mm. diam., 28 cm. long including the raceme, brown below ; *raceme* 12½ cm. long, about 12 spirally arranged flowers and buds, 1 open at a time ; *pedicels* 7 mm. long, barely 1 mm. diam., greenish-brown ; *sterile bracts* 2, 5½ mm. long, the lower one 5 cm. from base of peduncle ; *fertile bracts* 3½ mm. long, deltoid-lanceolate, acuminate, white, with a fine brown nerve ; *perianth* white, brown nerved,

17 mm. long, the cylindrical-hexagonal sub-globose base 3 mm. diam., only slightly constricted above, the base tapering to the pedicel, oblong, spreading, ± curved ; *upper segments* obtuse, channelled, the inner one straight, tip incurved, face colour white at tip to green below with a broad greenish-brown nerve, the 2 outer segments short-recurved-revolute, not spreading, face colour white with a broad greenish-brown nerve ; *lower segments* obtuse, the inner one channelled, revolute, face colour white with a greenish-brown nerve ; the 2 outer replicate, recurved about 90 degrees, spreading, face colour pure white at tip, greenish below, with a broad greenish-brown nerve ; *stamens* 6 and 7½ mm. long ; *ovary* 3 mm. long, 1⅓ mm. diam., bright green ; *style* 2 mm. long, ± bent, capitate, yellowish-white.

Habitat : Cape Province ; Willowmore Dist. (Type, *G. G. Smith*, 2176 in East London Museum Herbarium.)

Distribution : not further known.

This variety was collected by the author in Oct., 1937, 15 miles N.E. of Willowmore. Compared with the species, the leaves are more pointed and not as scabrous, the margins are more horny and shining and the pedicels are shorter.

Haworthia Nortieri G. G. Smith. (Liliaceae - Aloineae.) Sect. Laetevirentes.

Rosetta acaulescens, diam. 6½ cm.

Folia 43 circiter, longa 37 mm. lata supra mediam partem 12 mm., obovata, acuto-lanceolata ; *seta extrema* longa 13 mm., denticulata ; *supra* convexa, notis parte superiore irregulariter dispositis oblongis pellucidis percursa, lineisque 7 subrubido-fuscis vel viridibus, reticulatis anastomosentibusque, basim versus rubido-viridibus, apicem versus subrubido-fuscis instructa ; *subtus* convexa notis superiore parte oblongis pellucidis percursa ; *margines carinaque* dentibus pellucide albis ornati.

Pedunculus simplex, diam. una cum racemo sublaxe floreato 1½ mm. ; *pedicelli* longi 2½ mm., diam. 1 mm., fusci ; *perianthium* album, longum 15 mm. ; *ovarium* longum 3 mm., diam. 1¼ mm., claro-viride ; *stylus* longus ¾ mm.

Rosette acaulescent, 6½ cm. diam., not or very slowly proliferous from the base.

Leaves about 43, the young erect and ± incurved, the old ascending and incurved, ± firm, 37 mm. long, 12 mm. broad above the middle, 6 mm. thick, obovate, acute-lanceolate : *end-awn* 13 mm. long, white, persistent, denticulate ; *face* convex, ± swollen above the middle, smooth, irregularly pellucid in the upper ½ in solitary and confluent longitudinally

oblong pellucid markings, this pellucid area about 18 mm. long, with 7 mauvish-brown or green reticulate and anastomosing lines, 2—3 of which reach the tip, reddish-green below, mauvish-brown above, dull ; *back* convex, smooth, with solitary and confluent longitudinally oblong pellucid markings in the upper $\frac{1}{2}$, and 11 indistinct darker ($\pm$ reticulate) and anastomosing lines which are reddish near the tip, the leaf light green below, mauvish-brown above, dull ; *margins* acute, with $1\frac{1}{4}$ mm. long pellucid-white acuminate teeth at middle of leaf, smaller at tip and becoming very small below ; *keels* 2 in the upper $\frac{1}{3}$, the teeth the same colour as those on the margins but smaller.

Peduncle simple, terete, $1\frac{1}{2}$ mm. diam., including the sub-laxly 17-flowered raceme about 27 cm. long, the flowers and buds spirally arranged, light greyish-brown below ; *raceme* 10 cm. long, 3 flowers open simultaneously ; *pedicels* $2\frac{1}{2}$ mm. long, 1 mm. diam., brown ; *sterile bracts* 9, 8 mm. long, the lowest $1\frac{1}{2}$ cm. from base of peduncle ; *fertile bracts* 4 mm. long, deltoid, acute, white with a fine reddish-brown nerve ; *perianth* white, 15 mm. long, the cylindrical-triangular base 4 mm. across, gradually constricted to $3\frac{1}{2}$ mm. above, not stipitate, ovate, ascending-spreading, $\pm$ curved ; *upper perianth segments* obtuse, channelled, recurved, the inner one short, face colour golden-yellow and white tipped, and with a broad greenish-brown nerve, the 2 outer ones more recurved (about 90 degrees), $\pm$ spreading, face colour white with a medium-fine greenish-brown nerve ; *lower segments* obtuse, channelled, the inner one recurved-revolute, long, face colour white with a medium-fine greenish-brown nerve, the outer segments more recurved (about 90 degrees), spreading, face colour golden-yellow and white tipped, with a broad greenish-brown nerve ; *stamens* 6 and 5 mm. long ; *ovary* 3 mm. long, $1\frac{1}{4}$ mm. diam., light green ; *style* $\frac{3}{4}$ mm. long, dull white, bent, capitate.

Habitat : Cape Province ; Van Rhynsdorp Dist. (Type *G. G. Smith* 1676/a in East London Museum Herbarium.)

Distribution : not further known.

This interesting species was collected by the Author near Doorn River bridge, about 28 miles N.W. of Clanwilliam, in Jan., 1937, the locality having been given by Dr. Nortier, of Clanwilliam, after whom I have much pleasure in naming the plant. The leaf markings and the colour of the flowers are quite distinctive and the plant is thus easily recognised.

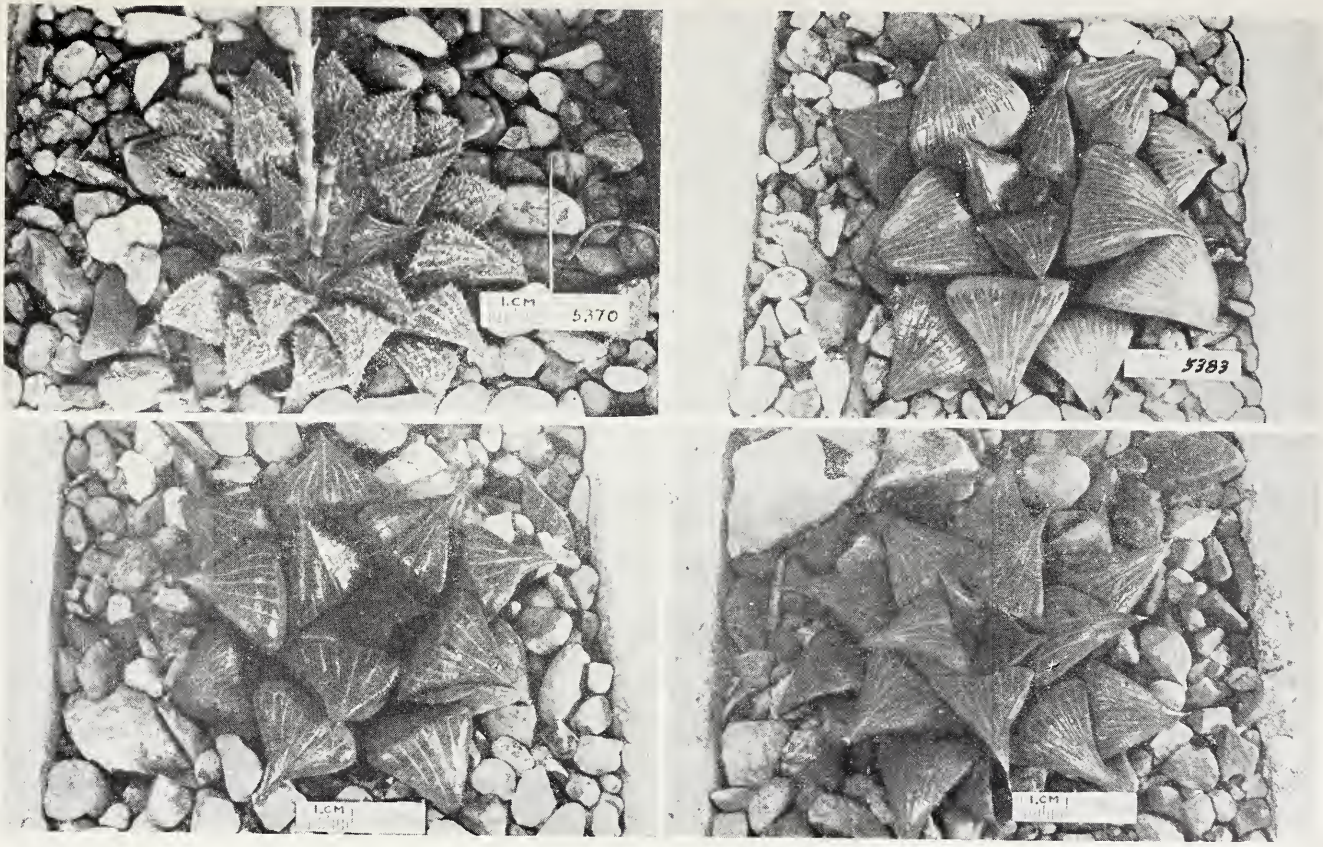


PLATE I.

H. Schuldtiana var. *major*.
H. retusa var. *solitaria*.

H. retusa var. *multilineata*.
H. retusa var. *densiflora*.

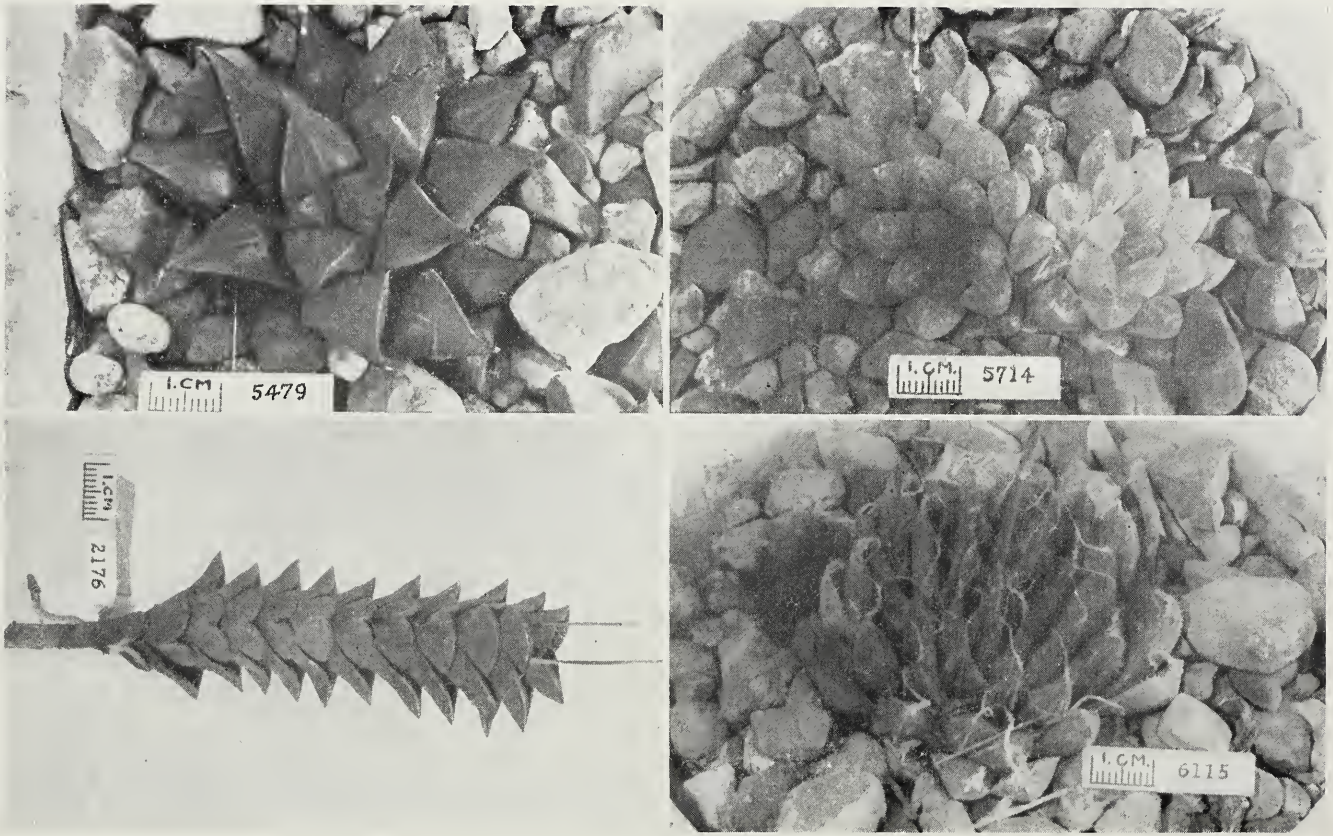


PLATE II.

H. mundula.
H. asperiuscula var. *patagiata.*

H. turgida var. *pallidifolia.*
H. Nortie i.

DIE SAADKNOP EN EMBRIOLOGIE VAN *BRABEIUM STELLATIFOLIUM*, L.

Deur P. G. Jordaan.

Die materiaal wat vir die studie van die wilde amandel (*Brabeium stellatifolium*) gebruik is, is langs Eersterivier en die meulsloot (Stellenbosch) versamel, waar die plante in hul natuurlike staat voorkom.

Die plante blom in Desember. Die blomme en vrugte ontwikkel vinnig. Teen die end van Desember is byna al die blomme tot niet en teen die end van Februarie is al die vrugte volwasse.

1. Die Voor-ontwikkeling van die Saadknop.

In elke vrughok ontstaan twee saadknoppe gelyktydig langs mekaar op dieselfde hoogte op die buiknaat. Die saadknoppe ontstaan feitlik in die top van die vrughok. [Fig. 1.]

Op 'n vroeë stadium groei die aanleg van die saadknop in die rigting van die blombodem en kry sodoende 'n langwerpige en geboë vorm. Hierna word die saadknopvliese aangelê. Eers ontstaan die binnevlies as 'n kraag om die basis van die aanleg [fig. 2] en daarna ontstaan die buitevlies as 'n tweede kraag tussen die binnevlies en die placenta. [Vgl. fig. 3.]

Beide vliese is by hul ontstaan twee sellae in deursnee. Wanneer die makrospoor-moedersel uitgedifferensieer is, is die kerntepel vier sellae hoog en word die moedersel van die makrospore aan elke sy deur drie tot vier lae nucellusselle omring. As die moedersel van die makrospore gevorm is, kan 'n dekweefsel onderskei word. [Fig. 4.]

Wanneer die blomme oopgaan, is die saadknop ·30 mm. lank en het die binnevlies verby die top van die nucellus gegroei en 'n kort endostoomkanaal gevorm. Die binnevlies is nou drie sellae in deursnee.

2. Die Volwasse Saadknop.

Wanneer die saadknoppe volwasse is [fig. 7], is hulle 440 mk. in lengte. In elke vrughok is twee normale, feitlik hangende saadknoppe wat aan die buiknaat [fig. 8] en bo in die vrughok vas is. Daar is geen raphe nie en 'n funiculus is nie te onderskei nie. Hoewel die chalaza effens krom is, kan die saadknop as ortotroop beskrywe word.

Die nucellus is ·17 mm. lank en is aan sy basis nou heelwat wyer (·12 mm.) as voor die blomme oopgegaan het. In die kerntepel, wat ongeveer vier sellae hoog is, is 'n dekweefsel beswaarlik te onderskei. In die kerntepel sowel as om die sye en die basis van die kiemsak bestaan die nucellus uit isodiametriese of veelkantige selle. Om die kiemsak is die nucellus 4—6 sellae in deursnee. [Fig. 9.] In die basale sye van die nucellus is die selle reghoekig. Behalwe die een of meer uitgeteerde en (of) half-verworde selle teen die kiemsak, is al die selle plasmaryk en teelvermoënd.

Die endostoomkanaal is ongeveer 60 mk. lank en die deel van die binnevlies wat dit omring, is vier sellae in deursnee en effens dikker as die res van die vlies. Die binnevlies is origens drie sellae dik en die selle is almal eenders. [Fig. 9.] Die buitevlies is twee sellae [fig. 9] in deursnee en bereik nie die top van die binnevlies nie.

Die chalaza bestaan uit plamaryke selle en grens direk teen die nael. 'n Vaatbundel trec deur die nael direk in die chalaza. Die vaatbundel, waarin tracheïede gedifferensieer is, loop dood 'n end verwyder van die basis van die nucellus sonder om te vertak. Die chalaza is massief in vergelyking met die res van die saadknop en is feitlik net so lank soos die nucellus. Die saadknop bevat geen basaalweefsel nie en geen grens kan tussen die chalaza en die nucellus onderskei word nie.

3. Die Voor-ontwikkeling van die Kiemsak.

Net na die binnevlies ontstaan het, is die makrospoor-moedersel in die nucellus te onderskei. [Fig. 2.] Die sel vergroot, word meer prominent [fig. 3 en 4] en wanneer die blomme hul volwasse lengte feitlik bereik het, verdeel dit en vorm 'n liniêre reeks van vier baie klein makrospore. [Fig. 5.] Een van die spore, vermoedelik die chalazale een, gee oorsprong aan die kiemsak. Die makrospoor-moedersel is die enigste sel in die nucellus wat sitologies verskil van die aangrensende selle.

Uit die primêre kiemsakkern ontwikkel ag kerns wat, gewoonlik voordat die blomme oopgaan, georiënteer is soos in die volwasse kiemsak. 'n Kenmerk van die kiemsak is dat sy ontwikkeling vanaf die volwasse makrospoor-moederselstadium tot die volwasse stadium baie vinnig verloop.

4. Die Volwasse Kiemsak.

In die vars, oop blomme is die kiemsak plasmaryk, 100—130 mk. lank en 36—48 mk. breed op sy wydste. Die kiemsak is chalazaalwaarts en mikropielwaarts toegespits. [Fig. 6 en 7.]

Die chalazale punt van die kiemsak word ingeneem deur drie plasmaryke, eenkernige, antipodale selle met gemeenskaplike dwarswande.

Die selle lê soms in 'n vertikale reeks. [Fig. 6.] Meestal lê een sel in die uiterste punt en lê twee teen hom. [Fig. 11.] Namate die blomme ouer word, trek die protoplasma weg van die selwande en word deursigtiger.

Die twee plasmaryke polare kerns lê styf teen mekaar net bokant die middel van die kiemsak. [Fig. 6 en 7.] Na die blomme 'n rukkie oop is, is die polare kerns meestal half versmelt. [Fig. 9.]

In die toppunt van die kiemsak lê die drie plaasmaryke selle van die eier-appraat naastenby op dieselfde hoogte en styf teen mekaar. [Fig. 6 en 10.] Die synergidae word meer langwerpig namate die saadknop ouer word. Die skerp toppunte van die ou synergidae is plasmaryker as die res van die sel.

5. Die Kiemwit.

Wanneer die vrug begin te ontwikkel, neem die saadknop vinnig toe in grootte. Gepaard met die aanwas van die saadknop gaan 'n buitengewone toename in lengte van die kiemsak. As die kiem 62 mk. lank is, is die kiemsak 1·6 mm. lank en as die kiem 2·7 mm. lank, is die kiemsak 10 mm. lank. [Fig. 17.] Die kiemsak baan sy weg deur die nucellus tot in die chalaza wat deur sekondêre groei in lengte en breedte toeneem. Die onderpunt van die kiemsak groei nie eweredig nie met die gevolg dat die kiemsak uitstulpings (vertakkings) ontwikkel. [Fig. 14 en 17.] Die chalazale deel van die kiemwit-bevattende deel van die kiemsak is gewoonlik die wydste en hierdie deel is meestal met 'n nou hals verbind met die deel om die kiem. In jong na-bevrugtingstadia lê die kiemsak los van die omringende weefsels en kan dit met min moeite uitgedissekteer word.

Die kiemwit vorm eers 'n lagie met vry kerns teen die wand van die kiemsak. [Fig. 12 en 13.] Wanneer die saadknop 4 mm. en die kiemsak 3 mm. lank is en die kiem aktief begin te ontwikkel, vorm die kernkiemwit wat teen die kiem grens en waar dit die kiemsak van kant tot kant vul, selwande. Op hierdie wyse ontstaan duidelik gedifferensieerde kiemwitselle. Aanvanklik is die selle plasmaryk en meestal bevat elk esel net een kern. [Fig. 14 en 15.]

Namate die kiem verleng, word die kiemwit teenaan die kiem geabsorbeer en word nuwe kiemwitselle chalazaalwaarts gevorm. Die absorbsie en aanwas van die selkiemwit hou aanvanklik tred met mekaar en op geen tydstip is daar 'n groot volume selkiemwit aanwesig nie. Kiemwit word nooit tussen die kiemblare gevind nie. [Fig. 17.]

As die saadknop 12 mm. en die kiem 6 mm. lank is, bevat die kiemsak 'n klein hoeveelheid half-uitgeteerde selkiemwit. Die basale helfte van die kiemsak is dan nog uitgeklee met 'n wandbeleg van kernkiemwit. Voordat die kiem sy volwasse lengte bereik, is die selkiemwit en kernkiemwit, behalwe vir 'n vormlose vliesie hier-en-daar, geabsorbeer.

6. Die Kiem.

Die stuifmeelbuis groei deur die endostoomkanaal en baan 'n weg deur die dekweefsel. [Fig. 12.]

Die kiemsak is meer as 700 mk. lank en bevat al heelwat kernkiemwit voordat die bevrugte eier [fig. 12] begin te verdeel. Geen kiemdraer kon onderskei word nie. [Vgl. fig. 13.]

Namate die kiemselle vermeerder, word die kiem langwerpig en toegespits in die rigting van die mikropiel. Eers as die kiem ongeveer 130 mk. lank is, word dit gedifferensieer in 'n dermatogeen en 'n protomeristeem. Die dermatogeen word nie oor die skerp punt van die kiem gevorm nie. [Vgl. fig. 15.] Die kiem vul die mikropilêre deel van die kiemsak van kant tot kant.

Die kiemblare word eers aangelê nadat selkiemwit teen die kiem gevorm het en wanneer die kiem meer as 300 mk. lank is. [Fig. 15.] Teen dié tyd is die kiemsak al ruim 3·7 mm. lank. Die kiemblare ontstaan deurdat in twee teenoorgestelde sye van die wye deel van die kiem groei vinniger geskied as in die res van die kiem. Wanneer die aanleg van die kiemblare onderskei kan word, kan die stam-aanleg gewoonlik ook onderskei word. [Fig. 15.] Reeds by hulle ontstaan is die aanlegte van die kiemblare en stam bedek met 'n dermatogeen wat aaneenlopend is met dié van die res van die kiem.

Die kiemblare ontwikkel vinnig en is spoedig langer as die kiemwortel. Op 'n vroeë stadium word die protomeristeem van die kiemblare gedifferensieer tot 'n pleroom en peribleem. Die pleroom word uitgedifferensieer as 'n onvertakte desmogeenbundel vanaf die pleroom van die kiemwortel. Later vermeerder die desmogeentakke in die kiemblaar.

Die kiemblare is spoedig ook heelwat wyer as die kiemwortel. As die kiem ongeveer 2·5 mm. lank is, begin die selle in die basis van die twee sye van elke kiemblaar teen die kiemwortel aktief te groei en elke kiemblaar vorm sodoende twee lobbe wat afwaarts om die kiemwortel groei. [Vgl. fig. 19—25.] In die volwasse kiem strek hierdie lobbe teen die sye van die kiemwortel soms verby die punt van die wortelmus. [Vgl. fig. 27.]

Wanneer die aanleg van 'n kiemblaar te onderskei is, is 'n differensiasie in die protomeristeem van die kiem waar te neem. Op die mediaan van die kiem, naby die spits punt, is die inisiaalgroep duidelik te onderskei. [Fig. 15.] Chalazaalwaarts van die inisiaalgroep word die pleroom uitgedifferensieer. Die differensiasie begin teen die inisiaalgroep en word in die rigting van die kiemblare voortgesit. Die pleroom en die binnenste lae van die peribleem loop uit op die inisiaalgroep.

Byna onmiddellik na sy ontstaan is die pleroom van die kiemwortel

gedifferensieer in 'n endisteem wat teen die inisiaalgroep grens, en 'n desmogeensilinder. [Fig. 17, 20 en 21.] Ongeveer halfpad tussen die inisiaalgroep en die spits van die pluimpie verval die desmogeensilinder eers in twee, daarna in vier [fig. 22] en aan die basis van die pluimpie [fig. 23] in 'n hele aantal desmogeenbundels. Sommige van hierdie desmogeenbundels is kontinu met dié van die kiemblare.

Wanneer die inisiaalgroep uitgedifferensieer het, is die wortelmus ook afgebaken. [Fig. 15.] Die selle in die punt van die wortelmus is meer deurskynend as die aangrensende selle. Voordat die kiemblare baie ver ontwikkel het, kan 'n kaliptrogeen in die basis van die wortelmus onderskei word. [Fig. 17.] Die kaliptrogeen word uit die buitenste lae van die peribleem, en tot 'n geringe mate uit die inisaalgroep, gevorm. Die wortelmus is 'n prominente deel van die kiemwortel.

Nadat die kiemblare 'n ent ontwikkel het, vorm die stam-aanleg 'n boggel wat dan duidelik as die pluimpie uit te ken is. [Fig. 17.] Die pluimpie bly kort en in die vlak ewewydig met die plat kante van die kiemblare is dit die wydste. [Fig. 25.] Die pluimpie ontwikkel voor ontkieming nie verder as die protomeristeemfase nie.

In die volwasse saad is die kiem naastenby 3 em. lank en ongeveer een-derde van die lengte van die kiem lê in die ehalaza. Die kiemblare is hard en hul lê so styf teen mekaar dat hul beswaarlik van mekaar te skei is. Die lobbe van die kiemblare lê ook so styf teen mekaar dat ook hulle met moeite afsonderlik te onderskei is.

Setmeel is die belangrikste reserwestof in die kiem. 'n Groot hoeveelheid eiwit word ook gebêre.

7. Die Nucellus na Bevrugting.

Na bevrugting gaan een saadknop altyd tot niet. Dikwels teer albei saadknoppe uit.

In 'n saadknop wat na bevrugting normaal ontwikkel, bly die nucellus lank meristematies. In die sye word die selwande reëlmatig aangelê en verdeel die selle hoofsaaklik periklinies. In die basis van die nucellus is die verdelings in alle rigtings. Die nucellusselle vergroot en hul toename in lengte is veral opvallend. Terwyl die nucellusselle groter word, bly die selle van die ehalaza aanvanklik klein met die gevolg dat kort na bevrugting die nucellus duidelik van die ehalaza onderskei kan word. Soms is 'n grens tussen die ehalaza en nucellus te onderskei voordat die selle in die basis van die nucellus verleng.

Wanneer die kiemsak die ehalaza bereik, en namate hy sy weg deur die ehalaza baan, verleng die ehalazale selle in die nabyheid van die kiemsak. Hierdie langwerpige ehalazale selle verskil nie van die nucel-

lusselle nie met die gevolg dat, wanneer die onderpunt van die kiemsak eers in die chalaza is, geen grens tussen laasgenoemde en die nucellus te onderskei is nie.

Die boonste helfte van die nucellus bly teelvaardig totdat die kiemblare aangelê word. Op hierdie stadium bestaan hier nog enkele lae plasmaryke nucellusselle. [Vgl. fig. 16.] As die kiemblare ontstaan, is die basis van die nucellus nog aktief verdelend. Die basis van die nucellus behou sy meristematiese toestand totdat die kiem sy volwasse grootte feitlik bereik het.

Wanneer die kiem 5·2 mm. lank is, het die nucellus om die mikropilêre helfte van die kiem heeltemal verdwyn. Verder chalazaalwaarts bestaan nog nucellus wat in die rigting van die chalaza in omvang toeneem. In die volwasse saad bly hoogstens 'n vormlose vlies van die nucellus oor. [Vgl. fig. 26.]

Die kerntepel bly bestaan lank nadat die nucellus om die mikropilêre deel van die kiem geabsorbeer is.

9. Die Saadhuid.

Namate die saadknop na bevrugting ontwikkel, vul dit die hele saadknop en lê die buitevlies mettertyd so styf teen die vrugwand dat dit beswaarlik van laasgenoemde te onderskei is.

Behalwe in die basis bly die buitevlies op die meeste plekke twee sellae in deursnee. [Vgl. fig. 16.] In na-bevrugtingstadia bevat die buitevlies byna altyd kleurstowwe wat òf in die buitenste òf in die binnenste sellaag òf in al die lae voorkom. Vandat die kiem ongeveer 3 mm. lank is, is die selle van die binnenste laag gewoonlik meer plasmaryk [fig. 16] en mettertyd is hul inhoud bruin gekleurd. In die volwasse saad bestaan die laag gewoonlik nog en is daar geen wesenlike verskil tussen sy selle en dié van die vrugwand nie. 'n Tweede sellaag van die buitevlies bly ook soms bestaan. [Fig. 26.]

Die getal sellae in die binnevlies vermeerder nie na bevrugting nie, behalwe heel in die basis. [Vgl. fig. 14 en 17.] Na die kiem ongeveer 2 mm. lank is, begin die selle in die buitenste laag te verleng en gaan dan tot niet. As die genoemde laag verword het, gebeur dieselfde met die middelste laag. [Vgl. fig. 16.] Later gaan die binnenste laag ook tot niet en bly net 'n vormlose vlies oor wat saam met die oorblyfsels (indien enige) van die nucellus en kiemwit die binnehuid vorm. [Fig. 26]. In die binnehuid is geen kutikula nie. 'n Swak ontwikkelde kutikula is soms in die jong na-bevrugtingstadia in die binneste sellaag van die binnevlies te onderskei.

Na bevrugting bly die chalaza meristematies totdat die kiem sy

volwasse lengte bereik. Wanneer die kiemsak die chalaza bereik en sy weg daardeur baan, verloor die selle in die nabyheid van die kiemsaak hul teelaktiwiteit, vergroot en dié wat teen die kiemsak grens, word geabsorbeer. Die teelaktiwiteit word sodoende beperk tot die sye van die chalaza.

Namate die saadknop verleng, vertak die vaatbundel en hierdie takke verloop in die buitenste deel van die chalaza tot by die basis van die binnevlies. Gewoonlik het baie selle aan die binnekant van die vaatbundelwyk 'n rooierige inhoud, terwyl dié aan die buitekant van die vaatbundelwyk 'n bruinerige inhoud bevat. [Fig. 14 en 17.]

As die saad volwasse is, is die chalaza ongeveer 1·5 cm. lank en bestaan die vaatbundelwyk en die bruingekleurde deel in die buitekant van die chalaza nog. Tussen die vaatbundelwyk en die kiemblare bestaan nog enkele lae onreëlmatige en uitgeteerde parenchymatiese selle.

SUMMARY.

The structure and the development of the ovule, embryo-sac, embryo and seed of *Brabeium stellatifolium, L.*, the only species of the genus *Brabeium*, are described.

The ovary contains two sessile, orthotropous ovules on the ventral suture. The ovule is without a raphe and has two integuments. In the full-grown ovule the nucellus consists of less than seven layers of cells around the embryo-sac. After fertilisation the nucellus and chalaza remain meristematic and the secondary cells thus formed are absorbed.

The testa is membranous, without a crystal layer and no cuticula develops from the inner integument.

The embryo-sac develops normally and contains eight nuclei or cells. The part of the embryo-sac which lies in the chalaza after fertilisation, is branched. Cellular endosperm is never formed in the tips of the branches. The ripe seed is exendospermous.

The two large, hard cotyledons have basal lobes and the endistem of the radicle is clearly differentiated up to the initial group. The calyptrogen is a product of the external layers of the periblem. The embryo stores starch and proteins.

VERDUIDELIKING VAN DIE VERKORTINGS WAT AS BYSKRIFTE BY DIE TEKENINGE GEBRUIK WORD.

a.pl.	aanleg van pluimpie.
a.s.	antipodale sel.
a.sk.	aanleg van saadknop.
bb.	blomdekblaar.
b.e.	bevrugte eier.
bin.h.	binnehuid.
b.kb.	basis van kiemblaar.
bl.	blomsteel.
bs.	blomskub.
buit.h.	buitehuid.
ch., ch.s.	chalaza.
d.	dermatogeen.
des.	desmogeen.
dw.	dekweefsel.
e.	eier.
en.	endisteem.
end.k.	endostoomkanaal.
ev.	binnevlies.
f.kb.	flap van kiemblaar.
f.m.	chalazale makrospoor.
ig.	inisiaalgroep.
k.	kiem.
kb.	kiemblaar.
kg.	kaliptrogeen.
kkw.	kernkiemwit.
ks.	kiemsak.
kt.	kerntepel.
kw.	kiemwit.
l.ks.	een van die lobbe aan die onderpunt van die kiemsak.
m.	makrospoor.
mer.	kernmeristeem.
m.m.	mikropilêre makrospoor.
m.ms.	makrospoor-moedersel.
nuc.	nucellus.
o.	'n deel van die saadknop wat aan die buitekant van die vaatbundels voorkom en wat selle met 'n bruin inhoud bevat.
o.ks.	onderpunt van kiemsak.
p.	pleroom.
pb.	peribleem.
p.k.	polare kerns.
pl.	pluimpie.
pr.	protomeristeem.
r.	raphe.
s.	synergida.
sb.	stuifmeelbuis.
s.k.	sekondêre kiemsakkern.
skw.	selkiemwit.
t.ks.	top van kiemsak.
tv.	buitevlies.
v.	vrugblaar.
vb.	vaatbundel.
vh.	vrughok.
vw.	vrugwand.
w.	kiemwortel.
wm.	wortelmus.
x-x.	placenta.
y.	'n deel van die saadknop wat aan die binnekant van die vaatbundels voorkom en wat selle met 'n rooi inhoud bevat.
z.	die binnenste basis van die binnevlies.

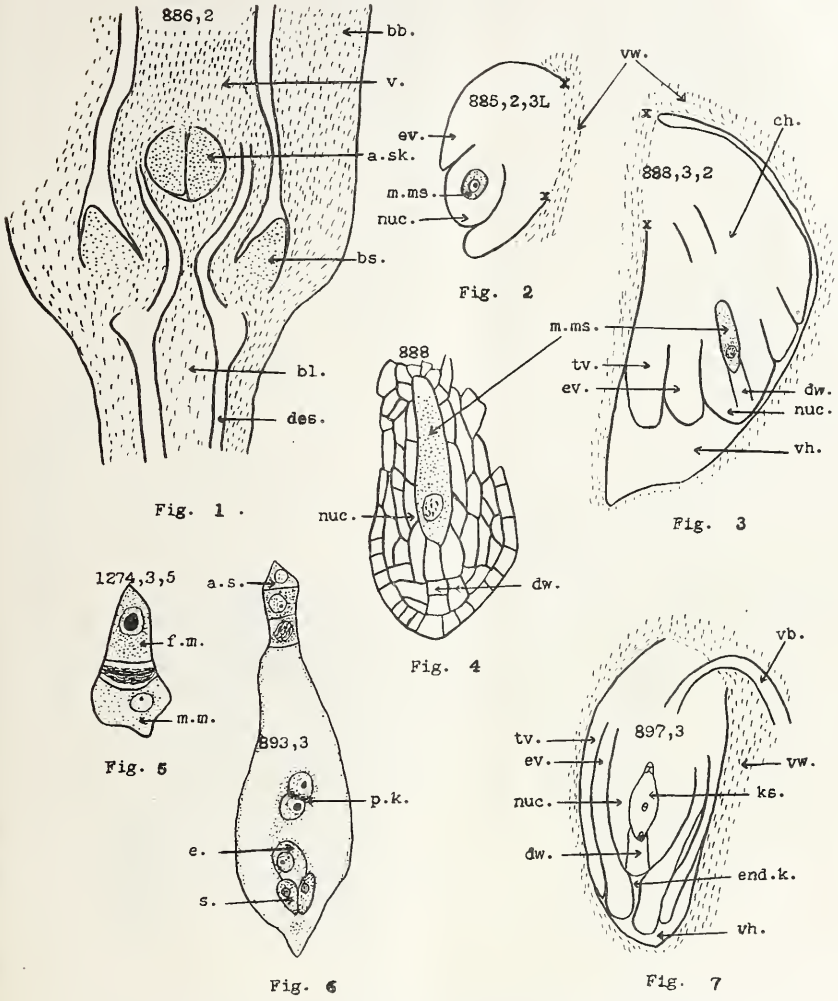


Fig. 1. 'n Lengtesnit deur die vrugbeginsel en blombodem van 'n blomknop. Die blom is ongeveer 1·3 mm. lank. bs. = die skottelvormige blomskub. ×110.
Fig. 2. 'n Jong saadknop waarin die buitevlies nog nie begin ontwikkel het nie. Die blom is ongeveer 2·5 mm. lank. ×270.
Fig. 3. 'n Jong saadknop. Die blom is ongeveer 5 mm. lank. ×270.
Fig. 4. Die nucellus met die makrospoor-moedersel van fig. 3. ×550.
Fig. 5. Vier makrospore. Die protoplasma van die middelste twee is aan die verword. Die blom is ongeveer 7·5 mm. lank. ×1100.
Fig. 6. 'n Volwasse kiemsak. ×550.
Fig. 7. 'n Volwasse saadknop. ×110.

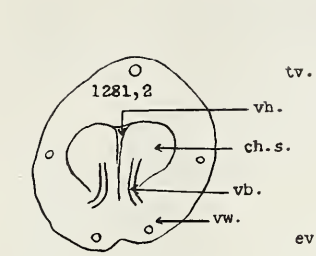


Fig 8

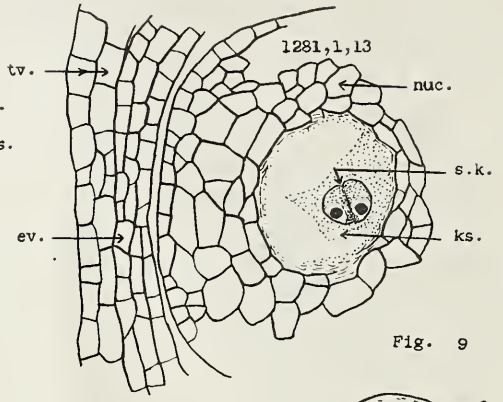


Fig. 9

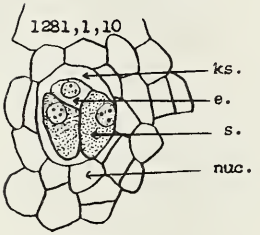


Fig. 10

Fig. 11

Fig. 12

Fig. 13.

Fig. 14.

Fig. 8. 'n Dwarssnit deur 'n volwasse vrugbeginsel, deur die naels van die twee saadknope. ×110.

Fig. 9. 'n Dwarssnit deur 'n deel van 'n volwasse saadknop. Die twee polare kerns het gedeeltelik versmelt om die sekondêre kiemsakkern (sk.) te vorm. ×550.

Fig. 10. 'n Dwarssnit deur die toppunt van 'n kiemsak. ×550.

Fig. 11. Die onderpunt van 'n volwasse kiemsak. Die protoplasma van die antipodale selle is besig om af te rond (of te verword ?). ×1000.

Fig. 12. Die top van 'n saadknop met 'n bevrugte eier (b.e.) en 'n stuifmeelbuis (sb.). Vrugte 3·8 mm. lank. ×180.

Fig. 13. Die toppunt van 'n kiemsak met 'n viersellige kiem. Die sel x van die kiem lê reg bo die vierde kiemsel. ×550.

Fig. 14. 'n Saadknop in 'n vrug wat 10 mm. lank is. x. = 'n onverteerde deel van die chalaza tussen die kiemsaklobbe. ×22.

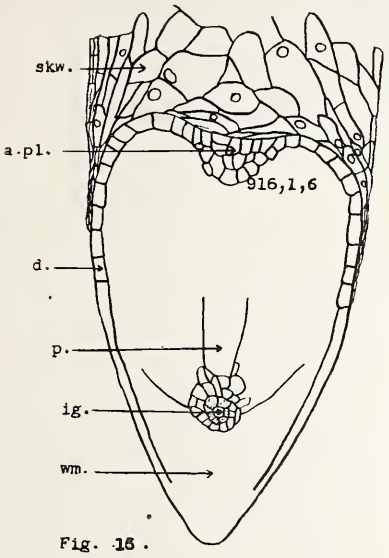


Fig. 15.

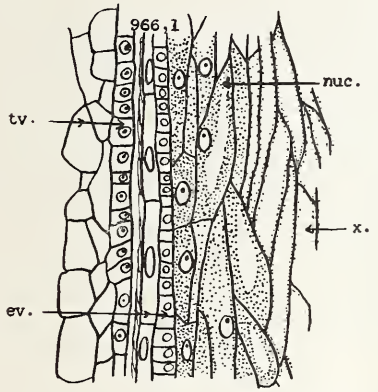


Fig. 16.

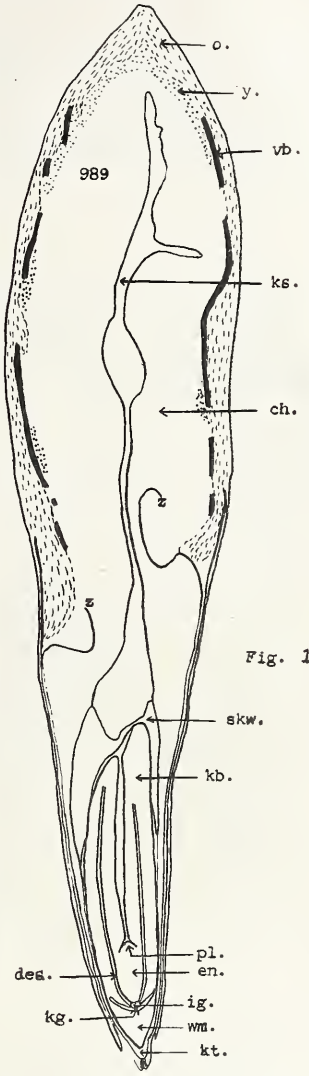


Fig. 17.

Fig. 15. 'n Jong kiem in 'n vrug wat 13 mm. lank is. Die pleroom (p.) is nog ongedifferensieer. ×220.

Fig. 16. 'n Deel van 'n saadknop om 'n kiem in 'n vrug wat ongeveer 1·7 cm. lank is. x. = van die verworde nucellusselle om die kiem. ×360.

Fig. 17. 'n Saadknop in 'n vrug wat 2 cm. lank is. ×18.

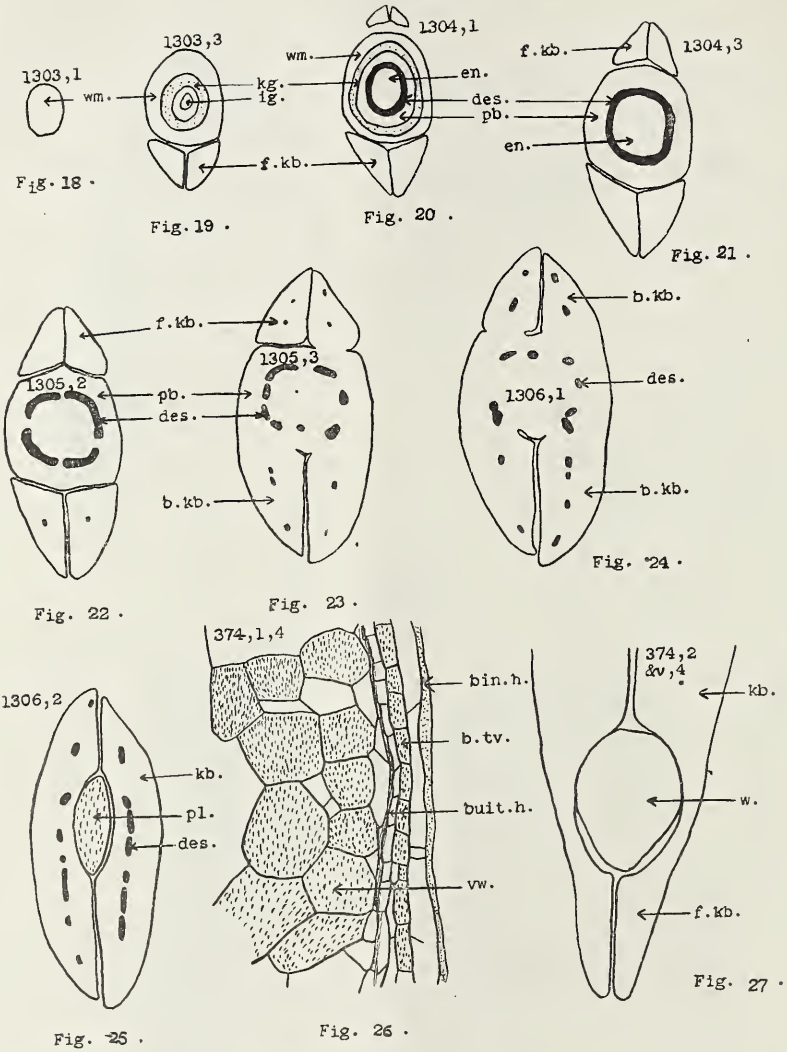


Fig. 18. Fig. 19. Fig. 20. Fig. 21.

Fig. 22. Fig. 23. Fig. 24.

Fig. 25. Fig. 26. Fig. 27.

Figure 18 tot 25 is tekeninge van dwarssnitte van 'n kiem wat ongeveer 6 mm. lank was. Die dermatogeen is in geen van die tekeninge ingeteken nie.

Fig. 18. 'n Dwarssnit van die wortelmus. ×18.

Fig. 19. 'n Dwarssnit van die kiemwortel deur die inisiaalgroep. ×18.

Fig. 20. 'n Dwarssnit van die kiemwortel naby die inisiaalgroep. ×18.

Fig. 21. 'n Dwarssnit van die kiemwortel agter die rand van die wortelmus. ×18.

Fig. 22. 'n Dwarssnit van die kiemwortel onderkant die basisse van die kiemblare en ongeveer half-pad tussen die inisiaalgroep en die spits van die pluimpie. ×18.

Fig. 23. 'n Dwarssnit deur die kiem by die basisse van die kiemblare. ×18.

Fig. 24. 'n Dwarssnit deur die basisse van die kiemblare. ×18.

Fig. 25. 'n Dwarssnit van die kiem deur die pluimpie. ×18.

Fig. 26. Die saadhuid en 'n deel van die vrugwand van 'n byna volwasse vrug. Die selle van die binnenste sellaag (b.tv.) van die buitehuid en die meeste selle van die vrugwand bevat 'n bruin inhoud. ×220.

Fig. 27. 'n Deel van 'n lengtesnit deur die sy van 'n kiem. ×14.

THE DEVELOPMENTAL MORPHOLOGY OF THE POLLEN OF PROTEACEAE.

By S. Garside.

Over a long period of years, the pollen grains of Gymnosperms and Angiosperms have been studied entirely from a morphological standpoint, most of the researches into their development and physiology having been made comparatively recently. A comprehensive historical review, more especially of the morphological work, has been given by Wodehouse (1935, pp. 16–100).

Most of the earlier workers were concerned with purely descriptive accounts of the mature grains, or with their comparative morphology, and it remained for Wodehouse (1935, 1936) to put forward a general theory of the evolutionary relationships of pollen forms in Gymnosperms, Monocotyledons and Dicotyledons.

Whilst this clever theory has many ramifications, its more essential features are that the monocolpate or one-furrowed grain which is so prevalent in Monocotyledons and a few of the primitive Dicotyledons, is the direct homologue of the monocolpate grain found in many Gymnosperms, whilst the tricolpate, or three-furrowed grain so prevalent as the basic form in Dicotyledons is a new development, the three furrows in this case being meridional, at right angles to the spore equator, and alternating with the triradiate marking of the inner or proximal face of the spore when still in the tetrad. (Fig. 15.)

In the one-furrowed grain of Monocotyledons, the furrow is said to be formed on what is the distal or outer face of the spore in the original spore tetrad. In pollen without furrows, but with one germ-pore only (as in grasses) or with three germ-pores (as in some Dicotyledons) the pores are regarded as modifications of the furrows and occupy similar positions in each case.

According to this theory then, the great evolutionary advance made by the Dicotyledons is in the development of three equatorial furrows or pores, resulting in the possibility of pleurosiphonic germination, that is of several possible places of exit for the pollen-tube, situated on the equator, as opposed to basisiphonic germination, or germination from one pore only (or furrow) situated on the outer or distal face of the grain.

Wodehouse has quoted very few researches into the development of the mature pollen grain from the spore tetrad stage, especially researches in which the relative positions of the furrows or pores have actually been

observed, and indeed this could scarcely have been expected of him, as very little really precise knowledge of this kind exists.

He has therefore had to rely chiefly upon evidence obtained from the positions of furrows or pores in such grains as retain the tetrad grouping until maturity, e.g. Drimys with one pore on the distal face of each grain of the tetrad, and Erica with pores in six pairs. (Fig. 15.)

Cytologists usually lose interest in the pollen grain during the period between the completion of tetrad division and germination, consequently very few workers trouble to figure the changes undergone by the cell walls of the grains during their maturation, although in most cases adequate material for the purpose must have been available.

Thus a great deal of information of use to the pollen morphologist is not forthcoming, and lack of researches of this nature is doubtless the reason why Wodehouse has been forced to make so many assumptions (e.g. Wodehouse, 1935, pp. 334, 336 and 338) in support of his theory.

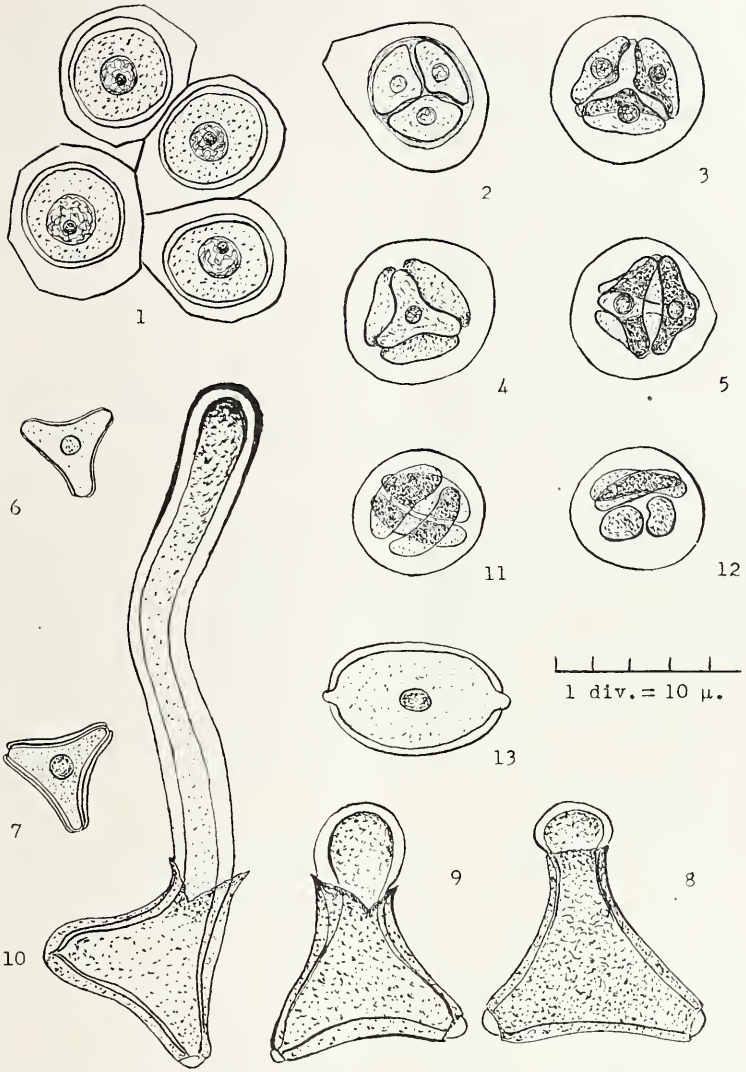
Doubt has already been cast upon the assumption that all monocolpate grains are homologous, e.g. the monocolpate grains of *Asimia angustifolia* A. Gray (Anonaceae) have been shown by Golub to have the furrow on what is the proximal or inner face of the spore when in the tetrad (Bailey and Nast, 1943) and it is now obvious that investigation of almost every case will be necessary before exact homologies can be elucidated.

The present work was undertaken in order to determine the relative positions of the germ-pores in the tetrad resulting from the division of the spore mother cell in Proteaceae : only the gross developmental features of the cells concerned were examined, cytological details being neglected.

From an extensive series of measurements of numerous genera and species of South African Proteaceae, the writer found that *Leucadendron argenteum* R.Br. has the largest mature pollen grain (45μ to 61μ in diameter) and this plant was therefore chosen for investigation as it was likely to have a large spore tetrad. In addition, it has three large circular germ-pores (11·5μ to 12μ in diameter) one at each angle of the flattened triangular grain. (Fig. 8.)

Tetrad division stages in *L. argenteum* are to be found in the anthers in June, when the young spherical knob-like spike of the male inflorescence is only about 1 cm. in diameter. Usually a developmental series can be found in a single inflorescence, as the lower flowers of the spike are considerably more developed than the upper ones.

Material preserved in 75% alcohol was found adequate for all purposes ; from it the spore tetrads can be dissected out entire and moved about and rotated under the microscope to obtain various views of the same



Figs. 1—10. *Leucadendron argenteum* R.Br. 1. Spore mother cells. 2, 3, 4, and 5. Tetrahedral spore tetrads. 6. Young microspore immediately after liberation from tetrad. 7. Young pollen grain, showing differentiation of exposporium. 8 and 9. Pollen grains showing early stages of germination. 10. Germinating pollen grain with pollen-tube. Figs. 11—13. *Embothrium coccineum* Forst. 11 and 12. Decussate tetrads from two points of view. 13. An almost mature pollen-grain. The scale is for all the figures.

tetrad. Microtome sections were not made, and no staining was necessary, though light staining with acetic methyl-green was of value. All the drawings have been made to the same scale so that the relative sizes of the various stages can be seen at a glance. The germination studies were of course made on fresh material.

From the younger anthers of the above-mentioned material, it is easy to isolate groups of spore mother cells (Fig. 1) when each cell is seen to be surrounded by a broad, clear gelatinous zone. In anthers in which tetrad division has taken place (Figs. 2 and 3) the spore mother cells have separated and the gelatinous wall becomes rounded off (Figs. 3, 4 and 5) and the tetrads are completely isolated. The young spores which compose the tetrad always have the tetrahedral arrangement and no deviation from this was observed. Various views of tetrads are shown in Figs. 3, 4 and 5; Fig. 5 is of special interest as at first glance it would appear to be an example of the decussate arrangement, but by revolving such a tetrad under the cover-glass, a view similar to that in Fig. 4 will appear. It is, in fact, only a somewhat unfamiliar view of the tetrahedral arrangement.

The clear gelatinous wall surrounding the spore tetrad now dissolves, and the spores readily separate (Fig. 6) without other change than that of rapid enlargement and thickening of the spore wall. When the exospore and endospore are differentiated (Fig. 7) it can easily be observed that the germ-pores are present on the angular tips of the spore (Fig. 7), i.e., they are on the spore equator and terminate the lines of the tri-radiate marking, which does not, of course, persist in the mature spore. Fig. 14 gives a diagram of the spores in the tetrad to illustrate the position of the pores in a spore in relation to the tri-radiate marking, and also to show the grouping of the pores in four groups of three, one group of three not being visible in the figure.

Fig. 14 should be compared with Fig. 15, which represents a tetrad of Erica, in which the germ-pores are seen to be alternating with the tri-radiate marking, and are grouped in six groups of two, an arrangement which Wodehouse appears to have considered to be typical of all tricolpate and three-pored grains in Dicotyledons.

It is clear therefore, that most of the tricolpate and three-pored pollens will require investigation before we know their real nature, and following the type of nomenclature used for embryo-sac types, we may call them after the genera or families in which they were first discovered.

The type shown in Fig. 15 has been established for Epilobium by a study of its development by Luerson (quoted by Wodehouse, 1935, p. 91) and might be called the "Epilobium type," whilst the development which follows Fig. 14 could be called the "Proteaceous type." Such a

terminology will only be of value until a wide survey of developmental types has been made, when we may expect the types to fall into some logical sequence, and it will then no longer be necessary.

In the writer's opinion, the proteaceous type may represent a very primitive spore type in Dicotyledons, as the grain has become very little altered from its original tetrahedral shape given to it in the tetrad division, and in this respect resembles the spores of many liverworts and of Sphagnum and some ferns. The question then arises as to the germpore in the proteaceous type being more primitive than the fold or colpa frequently found in spherical pollens. The fold or colpa is, as Wodehouse has clearly indicated, primarily an organ of size adjustment to the water

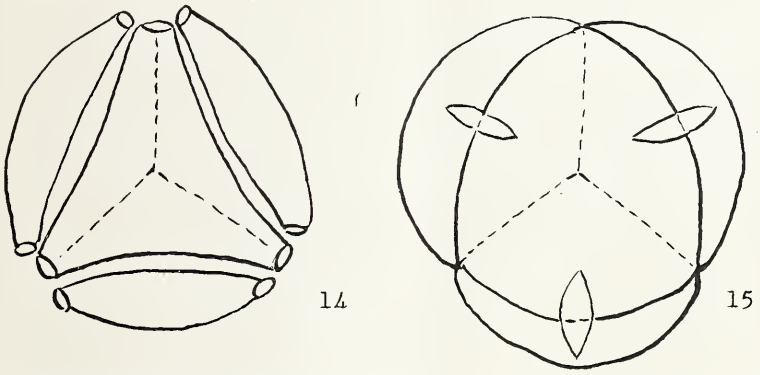


FIG. 14. Tetrahedral pollen tetrad of Proteaceae.
FIG. 15. Pollen tetrad of Erica. Both figures are diagrammatic.

content of the grain, and appears to be a decided advance on the simpler pollen of Proteaceae which has no such obvious specialisation. In any event, it is clear that the fold in many pollens is, because of its position, not the homologue of the pore in proteaceous pollen.

It is noteworthy that Thompson in his brief treatment of pollen grains (Thompson, 1942) remarks that the three folds "are formed (I take it) along lines of weakness at the edges of the tetrahedron," and it may be assumed that they would be more likely to form in grains in which an early thickening of the exosporium (preserving the tetrahedral form) does not occur. However, in making any assumptions regarding evolution, we must bear in mind Thompson's warning (loc. cit., p. 613) that resemblances in spores are "a matter of physical and mathematical symmetry, and carry no proof of near relationship or common ancestry."

Germination.

As the writer's object was to observe germination, and not to investigate the physiological conditions necessary for it, only a few pollen cultures were made.

Germination was slow in all cases, and comparatively few grains in each culture showed the first stages of germination, and fewer still formed a long pollen tube. 50, 20, 10 and 5% cane sugar solutions in water were used, the lower concentrations giving the best results.

No doubt the addition of ripe stigmas, yeast or traces of mineral salts might have greatly stimulated germination, but these experiments remain for future workers.

From the morphological viewpoint, it is to be noted that not more than one tube was ever obtained from one grain, and that there is no "dehiscence" or splitting away of the exospore on germination, only occasionally a slight tearing or cracking of the margins of the pore from which a tube has emerged, is to be observed. (Figs. 9 and 10.)

However, a very remarkable feature was the extreme thickness of the cellulose wall of the pollen tube (Fig. 10) which may be up to 5μ thick; a feature which has also been noticed by the present writer in other proteaceous pollen tubes, e.g., *Grevillea oleoides* Sieb., where the tube is very irregularly thickened. Tassi (1898) has also figured the pollen tube of Stenocarpus as having fairly thick walls.

In concluding this account of the three-pored pollen of *Leucadendron argenteum*, we must make a brief reference to the work of Brough (1933), who has investigated the development of the microspores of *Grevillea robusta* Cunn. After describing the miscospores as of "a precise tetrahedral form in the nearly mature flower bud" (loc. cit., p. 51), he says that the "thickening of the exine is not uniform however, and is distributed in such a manner that four unthickened areas are evident at the points of the tetrahedron," and also says that "the consequent increase in internal pressure is no doubt the cause of the protrusion of the intine at the four corners of the tetrahedron." These expressions undoubtedly lead one to suppose that there are here four germ-pores, and the writer has therefore re-examined the pollen of *G. robusta*, and finds it to be of the normal three-pored type. Brough's error is probably due to a *lapsus calami*, as his figures of the microspores all show three pores only.

Biporose Pollen.

We must now briefly consider the case of proteaceous pollen in which the grain is ovoid or sausage-shaped, and in the latter case often somewhat arcuate, with one pore at each end.

These peculiar two-pored grains are known for the genera Banksia, Dryandra and Embothrium, in which this form of pollen is a generic character in each case ; no examples of Proteaceae are yet known in which both two-pored and three-pored pollens occur in one genus or in one species (dimorphic pollen).

In the material examined, *Embothrium coccineum* Forst., the dividing spore mother cells invariably show the decussate arrangement of the young spores in the tetrad (Figs. 11 and 12), and it is clear that the two germ-pores must arise one at each end of the ovoid cells, as the latter undergo very little change of shape when increasing in size to become the mature ovoid pollen grains. (Fig. 13.)

Wodehouse (1932) in a short description, accompanied by a beautiful figure of the two-pored pollen grain of *Banksia Candolleana* Meisn. remarks, " It appears that this grotesque form is firmly established in the family, and is not due merely to some individual or specific anomaly in the arrangement of the pollen cells in their tetrads as the form suggests. Its origin in relation to tetrad formation certainly deserves further study." Now that such a study has been made and it is possible to compare it with the development of three-pored pollen, it appears that the form of the grain in biporose pollen is much more closely bound up with the arrangement of the spores in the tetrad than Wodehouse had supposed it to be.

Although Embothrium is the only genus so far studied, it appears probable that all biporose pollen of Proteaceae will have the decussate arrangement of the spores in the tetrad, as opposed to the tetrahedral grouping found to precede the formation of triporose grains.

As a sequel to this paper, the writer has in preparation a detailed account of the pollen morphology of many of the genera and species of South African Proteaceae.

My grateful thanks are due to Baron Aberconway, C.B.E., who allowed me to collect developmental stages of Embothrium from the plants growing in the open on his estate at Bodnant, Tal-y-Cafn, North Wales, and to Prof. R. H. Compton, who provided developmental stages and fresh material of Leucadendron.

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VOLUME XII.

PLANTAE NOVAE AFRICANAE.

" Ex Africa semper aliquid novi."—*Pliny.*

SERIES XXV.

By Professor R. S. Adamson, Rev. J. Gerstner and Captain (S.) T. M. Salter, R.N. (Ret.).

Hypertelis trachysperma Adamson sp. nov. (Aizoaceae.)

Herba annua succulenta glabra purpurascens. *Caules* prostrati, usque ad 15 cm. longi. *Folia* teretia vel subtrigona, carnosa, saepe glauca, 2—6 cm. longa, stipulis acuminatis. *Pedunculi* alterni, 3—4 cm. longi, foliis subaequilongi, 3—8-floriferi, pedicellis 3—9 mm. longis, apice incrassatis. *Tepala* carnosa, 2 mm. longa. *Stamina* 5, tepalis breviora, antheris rotundatis, filamentis tenuissimis. *Stigmata* 4 vel 5, saepissime 5, sessilia. *Capsula* subsphaerica, tepalis aequilonga. *Semina* reniformia, tuberculata.

At the margins of vleis on muddy soil. Fl. Feb.—Apl.

Hab. Cape Province. Cape Division: Zeekoe Vlei, *Walgate* 687 (*Type*, in Herb. Bolus): Kommetje *Adamson* (s.n.).

A larger plant than *H. arenicola* Sond., less glaucous and usually purplish, with larger leaves, stouter and longer peduncles, 5 stamens, 4 or 5 carpels, and tuberculate seeds. The stems are firmly pressed to the ground. The leaves on the main stem are subopposite and usually wither at the tip at flowering time, those on the branches are much shorter. The perianth segments are very thick,

Mezleria stenosiphon Adamson sp. nov. (Campanulaceae.)

Perennis decumbens. *Folia* obovata vel spathulata obtusa vel subacuta apice remote dentata, inferiora conferta breviter petiolata, superiora sparsa sessilia angustiora. *Flores* rosei corymbosi. *Lobi corollae* aequilongi patentes tandem reflexi, tubus cylindricus longissimus sepalis multoties longior. *Stamina* erecta, exserta, antheris posterioribus glabris, anterioribus minoribus pilis albis et seta unica longa terminatis. *Ovarium* obconicum.

Fig. 1. *Hypertelis trachysperma.* 1. Shoot, nat. size. 2. Young inflorescence × 5. 3. Flower, perianth removed × 5. 4. L.S. flower × 5. 5. Ripe seed × 5. *Del.* M. Walgate.

Stems 10—30 cm. long, ridged, glabrous, slightly woody at the base. *Leaves* 6—12 mm. long or rarely longer, 4—6 mm. wide. *Racemes* simple or compound, corymbose. *Pedicels* slender, 4—8 mm. long. *Corolla* rose-pink, the tube cylindrical, 1—1·5 cm. long, split to the base, the lobes equal, spreading, finally reflexed. *Anthers* dark blue or blue-black, glabrous, the anterior smaller and tipped with a tuft of white hairs and a single longer bristle, with minute membranous scales between the hair tufts. *Style* with a prominent ring below the small stigma.

Humus soils on the higher mountains. Fl. Jan.—Apl.

Hab. S.W. Cape : Upper Wellington Sneeuwkop, 5,500 ft. *Adamson* 3605 (type in Bolus Herb.) ; Mts. N. of Fransch Hoek Pass *Pillans* 6738 (as *Isolobus*) ; Sondereinde Mts. (A. Bolus) *Guthrie* 4570 ; E. of Kogelberg, *Stokoe* (s.n.).

In collections this has been assigned to *Isolobus* or even to *Laurentia* ; from either it is at once separated by the corolla and stamens.

The fresh material examined had flowers of a bright rose-pink ; Pillans notes the flowers as " purple ", Guthrie as " blue ". In the dried state there is no difference between these specimens.

Prismatocarpus debilis Adamson sp. nov. (Campanulaceae.)

Perennis. *Caules* tenues, ramosi, decumbentes vel prostrati, hispidi. *Folia* subglabra, inferiora opposita, ovata ovato-elliptica vel etiam subrotunda, obtusa vel acuta, brevissime petiolata, remote dentata, superiora alterna, angustiora, minora. *Flores* solitarii vel pauci, distantes, pedunculis longis tenuibusque. *Corolla* campanulata, sepalis linearibus longior, tubo lobis duplo longiora. *Fructus* sulcatus, glaber.

A very slender diffuse perennial in loose tangles. *Stems* 10—20 cm. long. Lower *leaves* opposite, 4—6 mm. long, 2·5—4 mm. wide, the upper alternate, smaller and more distant. *Peduncles* very slender, with 1 or less often 2—4 distant flowers. *Corolla* white or pale blue, 5—7 mm. long, the lobes about half as long as the tube. *Fruit* 1·2—1·8 cm. long.

Sheltered rock crevices on the upper parts of the mountains. Fl. Dec.—Feb.

Hab. S.W. Cape : Genadendal Mountains : at 3,000 ft., *Bolus* 7305 (Type, in Bolus Herb.) ; at 4,800 ft., *Schlechter* 9882 ; at 3,000 ft., *Schlechter* 10298 ; *Stokoe* (s.n.). Wellington Mts. ; Observation Peak at 4,000 ft. *Esterhuysen* 1712 ; Upper Sneeuwkop at 4,500 ft., *Adamson* 3606.

This species was first collected in 1885 and recognised as distinct by Bolus in 1887 when he attached the name to specimens. No description was, however, published. His suggested name is that adopted and the first collected specimens are the type.

Specimens from the Genadendal mountains have leaves about twice as long as wide, whereas those from the Wellington mountains have wider leaves, about as wide as long.

There are in Herb. Bolus two specimens, *Schlechter* 9975 from Michell's Pass, and *Bolus* 8337 from Ceres, which resemble *P. debilis* but are of stouter more rigid plants with a more branched inflorescence. They are dlants from lower altitudes, 2,000 ft. and 1,700 ft. respectively. Further collecting and field observation is needed before these plants can be definitely associated with or separated from *P. debilis*.

Croton steenkampiana Gerstner sp. nov. (Euphorbiaceae.)

Frutex 1—3 m. altus. *Rami* dense lepidoto-stellati, exstipulati. *Folia* cordata c. 5 cm —10 cm. longa et 3 cm.—6 cm. lata, integra, discolorissima, supra viridia et disparsite stellata, infra albis capillis stipitatis et stellatis tomentosa et basi glandulis 2 stipitatis ornata. *Flores* 6—15 in racemo monoecio. *Pedicelli* 3 mm.—5 mm. longi. *Sepala* triangularia 1·5 mm. × 3 mm. *Petala* nulla. *Ovarium* globosum, stellato-tomentosum. *Styli* 5 mm. longi, tres bis bifurcati. *Fructus* capsula trilocularis, seminibus tribus atris nitidis.

Fig. 2. *Croton steenkampiana*. 1. Flowering branch × ½. 2. Female flower, nat. size. 3. Stipitate stellate hair × 10. 4. Young inflorescence. 5. Base of leaf from below, showing two glands. *Del.* F. J. Gerstner.

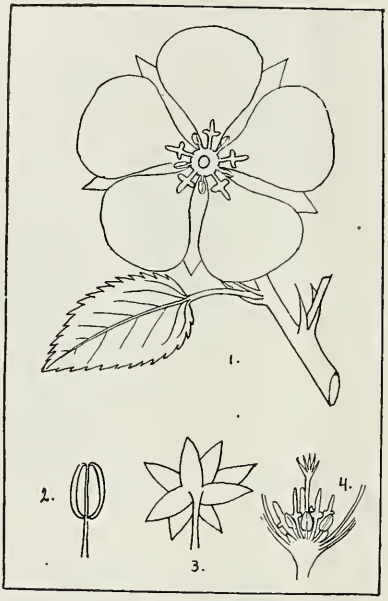


Fig. 3. *Melhania suluensis*. 1. Flower and leaf. 2. Stamen. 3. Calyx and epicalyx. 4. Genitalia. 1, 3 and 4, nat. size; 2, × 6. *Del.* F. J. Gerstner.

Hab. Zululand, District Hlabisa, at False Bay Bird Sanctuary. *Gerstner* 6128 et 6129. (National Herbarium et Kirstenbosch Herbarium.) It is named after Dr. L. Steenkamp, M.P. of Vryheid, in thankful acknowledgement of the interest and assistance which he gave me in my botanical research during the last two years.

The Zulu name is " iHubeshane ", a name which is also used around uBombo for *Croton subgratissimus*. It is a shrub 1—3 m. high. The branches, leaves and ovary are covered with white stellate and stipitate hairs. The cordate leaves especially are densely tomentose and white beneath with these stellate hairs. The base of the leaves is furnished with the stipitate glands usually present in this genus and are 3- or 5-nerved. The racemes are monoecious and have 6—15 small flowers, the few female ones being always basal. The male flowers were unfortunately all dried up in consequence of the drought during the last two years. The female ones have no corolla. The five calyx-lobes are triangular and hairy. The 3 stigmas are twice bilobed. The fruit is a trilocular capsule with three black shiny seeds.

Melhania suluensis Gerstner sp. nov. (Sterculiaceae.)

Frutex 50—120 cm. altus, erectus, foliosus ubique tomentosus seu pilosus et multibrachiatus. *Folia* numerosa, alternata, stipulata, lanceolata, c. 22 mm. longa et 12 mm. lata, dentata, 3—5-nervata, concolorata infra superque, tomentosa, nervis inconspicuis immersis, petiolo 5—10 mm. longo. *Flores* solitarii, pedicelli c. 20 mm. longi. *Epicalyx* segmentis 3 lanceolatis. *Calicis segmenta* 5, c. 7 mm. longa, lanceolata. *Corolla* quinque foliis c. 10—18 mm. longis et latis, ovatis, citro-luteis ornata. *Stamina* 5 fertilia et 5 infertilia. *Stylus* c. 12 mm. longus, stigma 5-brachiata ornatus. *Capsula* 5-locularis intra glabra, extra pilosa noma glabrescens. *Semina* 5, atra.

Hab. Zululand. Very frequent around the Dhlangubo Store half-way between Eshowe and Empangeni: found throughout the Umhlatuzi Bushveld. *Gerstner* 2888. (Durban Herbarium and Bolus Herbarium.) Flowered 15/9/36. This multibranched and rather woody shrublet is usually about 1 m. high and has very attractive lemon-yellow single flowers. The Zulus call it, as they do in the case of Sida and all malvaceous flowers, " uVemvane ", the " Butterfly ", on account of its quickly-fading nature. The serrate leaves are about 20 mm. long and 12 mm. broad, tomentose and greyish-green on both sides. The veinlets are sunk in the velvet surface and therefore scarcely visible. The petiole is about 5—10 mm. long. The flowers are usually single, the pedicels about 20 mm. long. The epicalyx has three lanceolate lobes, the calyx 5 similar ones. The 5 corolla leaves are ovate and about 10—18 mm. long and broad. The fruit, a 5-locular capsule, has 5 black seeds and is glabrous inside and hairy outside.

Grubbia gracilis Salter sp. nov. (Grubbiaciae.)

G. rosmarinifoliae affinis, sed ita differt :—*Fruticulus* minor, gracilior, 30—50 cm. altus. *Folia* anguste obcuneata, 4—6 mm. longa, valde

revoluta, basi subsagittata, lobis obtusis petiolo fere in longitudine aequantibus. *Bracteae* quarta pars bilobatae. *Filamenta* 0·5—0·7 mm. longa, subsigmoidea, basin versus ampliata, minute puberula.

A slender diffusely branched shrublet, 30—50 cm. high, the stem terete, striate, with tufts of hairs at the nodes. *Branches* downy, the ultimate branchlets hirsute. *Leaves* opposite, patent, at length reflexed, narrow-obcuneate to almost linear, but always tapering to the apex, 4—6 mm. long, 0·6—2 mm. broad, scabrid and pubescent when young but soon glabrescent above, strongly revolute, tomentose beneath, subsagittate at the base, the lobes obtuse, nearly as long as the petiole : petiole about 1 mm. long, hirsute. *Cymules* sessile, axillary, about 2 mm. long, 3- or rarely 2-flowered. *Bracts* ¼-bilobed, keeled, membranous, chestnut-brown, 1·4—1·6 mm. long, 2—2·4 mm. broad, the

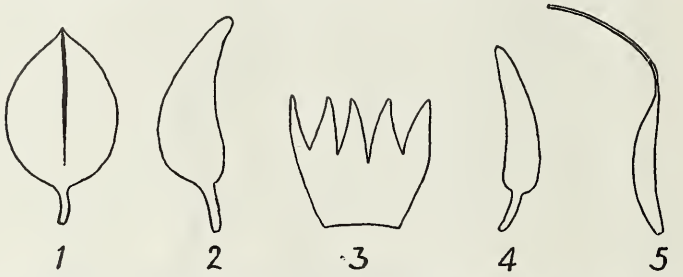


Fig. 4. *Rafnia ericifolia* Salter. 1. Vexillum × 3. 2. Carina × 3. 3. Calyx, flattened × 3. 4. Ala × 3. 5. Ovary and style × 4. (*Salter* 6567.) *Del.* T. M. Salter.

lobes very obtuse. *Flowers* closely pressed together. *Perianth* segments oval, convex, about 1 mm. long, incurved at the apex, the margins thickened, with 2 small swellings at the base : dorsal hairs white, about half as long as the segments. *Filaments* slightly sigmoid, swollen at the base, minutely puberulous : anthers 0·3 mm. long. *Ovary* 1-chambered, hirsute, with 2 pendulous ovules. *Style* filiform, 0·4 mm. long, enveloped in a dense tuft of disc-hairs. *Fruits* all three connate and inseparable in one row, forming a transversely oval hard dry 3-chambered syncarp, crowned with the three small, densely hirsute discs and the persistent styles.

Hab. Cape Province. Cape Peninsula : in marshes on Muizenberg Mt. Plateau, and near Muizenberg Reservoir. Alt. 1,300—1,500 ft. *Salter* 3594 (*type* in Bolus Herbarium), 2948 ; *Compton* 16430 (nearly in fruit). Flowers September. (*Co-types* distributed to Kew and British Museum.)

Of the four hitherto recognised species of Grubbia, *G. tomentosa* (Thunb.) Harms (*G. stricta* A.DC.) alone shows distinctive floral characters, and in the remainder the differences, with the exception of slight variation in the bracts of the cymule, are almost entirely in the vegetative characters. *G. gracilis* is a much smaller and more slender species than its nearest affinities, *G. rosmarinifolia* Berg. and *G. pinifolia* Sond., from which it can be at once recognised by the narrow-obcuneate leaves with a subsagittate base. The syncarp in these species is remarkable, for the three 1-chambered ovaries of each cymule fuse together in a row in fruiting, into what appears to be, in the middle lateral section, an inseparable 3-chambered capsule.

Rafnia ericifolia Salter sp. nov. (Leguminosae-Papilionatae) §Eu-Rafnia.

Fruticulus parvus glaber, ad 20 cm. altus, ramis numerosis adscendentibus vel diffusis, habitu tholiformi. *Folia* sessilia linearia, plerumque 5—8 mm. longa, 0·6 mm. lata. *Flores* pauci laterales uniflori flavi, plerumque ramulorum apices versus positi. *Pedunculi* semi-reflexi. *Calycis* lobi, lanceolati, tubo obconico fere in longitudine aequantes, posterior angustior. *Petala* in longitudine fere aequantia : *vexilli* lamina ovata acuta carinata : *carina* rostrata. *Ovarium* 4-ovulatum. *Legumen* planum, ad 2·3 cm. longum, 4·5 mm. latum, reflexum, subglaucum.

A small, rather compact glabrous shrublet, dome-shaped in habit, up to about 20 cm. high, with numerous ascending or spreading branches. *Leaves* ascending to erect, imbricate, sessile, linear, obtuse, mostly 5—8 mm. long, about 0·6 mm. broad, the median vein prominent above : margins sometimes slightly revolute. *Flowers* few, lateral, mostly near the apex of the branchlets. *Peduncles* 1-flowered, semi-reflexed, swollen at the apex. *Bract* filiform, scarcely 1 mm. long : bracteoles minute, 0·4 mm. long, near the base of the peduncle. *Calyx* about 7 mm. long, the tube subobconic : lobes as long as the tube, more or less lanceolate, the posterior narrower than the remainder. *Petals* yellow, subequal in length : *vexillum* about 1 cm. long, the lamina ovate, acute, keeled, 5 times as long as the curved claw : lamina of the *alae* obliquely lanceolate : *carina* rostrate, subacute, somewhat incurved, sparsely pilose. *Anthers* alternately globose and lanceolate, the latter sterile. *Ovary* about 5 mm. long, 1 mm. broad, 4 ovuled : style 6·5 mm. long, inflexed, the stigma minute. Pod about 2·3 cm. long, 4·5 mm. broad, flat, reflexed, somewhat glaucous.

Hab. Cape Province. Cape Division : near Hercules Pillar, *Salter* 6567 (*type* in Bolus Herbarium) and *Salter* 4346. Flowering Jan.—Mch.

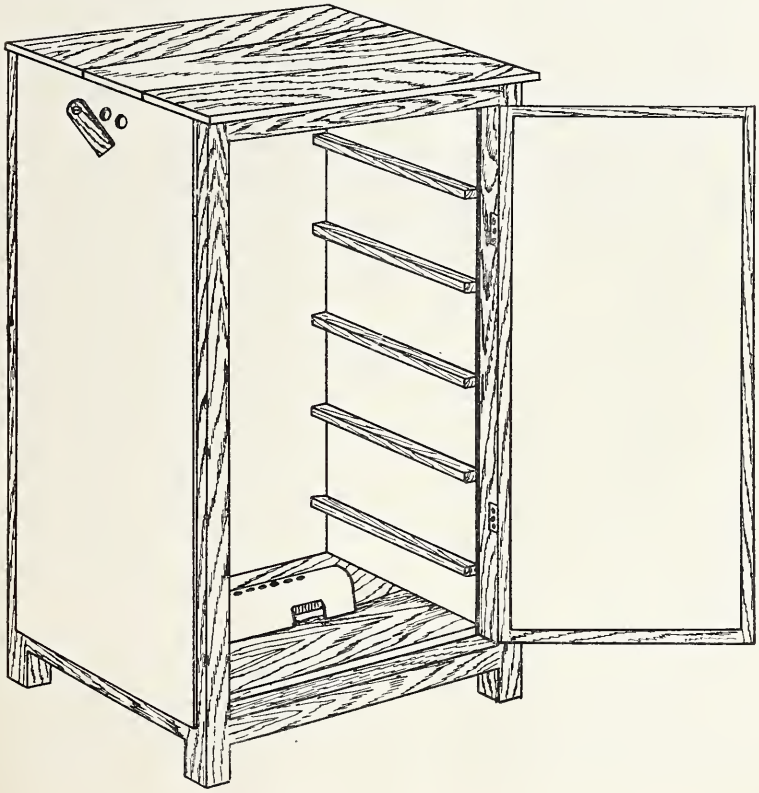
Also observed (not in flower) south of Paarl Berg. (*Co-types* distributed to Kew and the British Museum.)

This species has no near affinity : it can be at once distinguished by its dwarf habit and small ericoid leaves. Apparently it never flowers very profusely.

A DRYING CABINET FOR THE HERBARIUM.

By G. G. Smith.

Drying plants for herbarium purposes is a slow and laborious process at the best of times, especially with succulents. To speed up my work in connection with the drying of the large number of Haworthias and other succulents I am handling, I designed and put into use a small artificially heated drying cabinet, the results of which are proving most satisfactory, not only in the time and labour saved, but also in the improved appearance of the dried material.



An important feature of this method of drying is that the plants do not become brittle, nor have they the withered appearance usually found in plants dried in the ordinary way, without artificial heat.

Owing to the fact that the air inside this cabinet is not mechanically circulated, a low temperature element is all that is necessary, and with the permanently open air-holes at the bottom of the cabinet and the controlled ones near the top, one is able to control the heat inside the cabinet, and there is no danger of overheating.

The best drying temperature is about 120° to 150° F., at about the middle of the cabinet, and while I have not fitted a thermometer to this cabinet, it would be quite a simple matter to do so.

The cabinet consists of a frame of $1\frac{1}{2}$ inches by $1\frac{1}{2}$ inches of well seasoned oregon pine or other suitable wood. This frame is covered with any suitable board (such as a compressed fibre board used in the ceiling of a house) on the inside and outside so as to form an air-space between the linings for insulation purposes. The width inside the inner linings which is the width inside the cabinet must be $\frac{1}{2}$ inch more than the length of the drying presses that will be used in the cabinet, and the depth (from back to front) inside about 1 inch wider.

The bottom and top are closed in with timber about $\frac{1}{2}$ inch thick and the height inside the cabinet should be about 40 inches. Along each side are fixed five evenly-spaced rails of $1\frac{1}{4}$ inches by $\frac{3}{4}$ inch of suitable wood for carrying the drying presses.

The door frame is made of $1\frac{1}{2}$ inches by $\frac{3}{4}$ inch oregon pine with an intermediate horizontal rail and is also covered on both sides to form an air space.

The heating element can be easily made up by any electrical engineering firm, and should be of a type where the resistance wires rest on top of the porcelain so as not to throw any heat in a downward direction. It is advisable to have the resistance wires longer than necessary to give a low temperature, which temperature can then be raised as desired by the shortening of the resistance wires. The element must be securely fixed to the bottom of the cabinet with a space of at least 1 inch between the inside bottom of the cabinet and the under side of the element porcelain. The bottom board has about eight $\frac{1}{2}$-inch holes in a row immediately under the element so that air drawn in here must travel past the element.

The element is covered with a sheet metal hood to prevent the direct heat from the element impinging on the underside of the lower drying press. This hood is best made in the form of an inverted L, with lugs on the lower end for screwing on to the bottom board of the cabinet. The space between the top of the hood and the element must be at least

$1\frac{1}{2}$ inches, and the top or horizontal portion of the hood about 6 inches wide, with the open side towards the back of the cabinet.

Near the top of one of the sides of the cabinet two $\frac{3}{4}$-inch holes at about $1\frac{1}{4}$ inches centres are drilled through the inner and outer lining and a sleeve fitted to each hole so as to seal off the air space between the linings. The sleeves can be made of thick paper, glued to form a cylinder long enough to pass through the two linings, and may be glued in position with the outer ends flush with the outside of the cabinet. These holes are covered by a board about 5 inches long by $1\frac{3}{4}$ inches wide, and screwed near one end to hinge up and down and thus act as a damper for controlling the flow of air through the cabinet.

In operation the presses are placed in the cabinet, the lowest one as far back as possible, the next one as far forward as possible so as to be up against the door when closed. This arrangement of the presses enables the hot air to circulate along the under side of each press. It is only natural that the press nearest the element will receive more heat than the others, and it is therefore advisable if more than one press is being used, to change their respective positions in the racks, and even to turn them over occasionally.

For higher temperatures in the cabinet, the damper must be almost closed and opened up for lower temperatures. The cabinet will also be found very useful for drying the papers. For this purpose they may be loosely arranged on one half of a drying press placed towards the top of the cabinet.

NOTES ON THE SOUTH AFRICAN SAPOTACEAE

By Rev. J. Gerstner, O.S.B., Ph.D.

The following is a revised classification of the South African Sapotaceae, based on that of Engler.

Tribe 1. Palaquieae. Petals without appendages, not two or three times as many as the calyx lobes.
- Sub-Tribe 1. Sideroxylineae. Stamens 5 alternating with 5 staminodes.
  - Genus 1. Sideroxylon L.
    - *S. inerme* L.
- Sub-Tribe 2. Chrysophyllineae. Stamens 5.
  - Genus 2. Chrysophyllum L.
    - *C. natalense* Sond.
    - *C. viridifolium* Wood & Franks.
    - *C. magalismontanum* Sond.

Tribe 2. Mimusopeae. Petals with appendages. Segments of corolla tube twice or thrice as many as calyx lobes.
- Sub-Tribe 3. Multistaminales. Stamens twice or thrice as many as calyx lobes. No staminodes.
  - Genus 3. Labourdonnaisia Boj.
    - *L. discolor* Sond.
- Sub-Tribe 4. Staminodales. Stamens as many as calyx lobes and alternating with the same number of staminodes.
  - Genus 4. Mimusops L.
    - § Hexalobatae. Six calyx lobes, six stamens and six staminodes.
      - *M. concolor* E. Mey.
      - *M. mochisia* Baker.
    - § Octolobatae
      - *M. caffra* E. Mey.
      - *M. marginata* N. E. Br.
      - *M. obovata* Sond.
      - *M. Zeyheri* Sond.
      - *M. Henriquesiana* Sim.
      - *M. Schinzii* Engl.
      - *M. Kirkii* Bkr. f.

1. *Sideroxylon inerme* L., white milkwood, wit Melkhout: the Standard Zulu Name should be uMakwelefinqane ; other more local and ambiguous names are umHlahla, umBobe, and amaSetole. The Xosa name is umQuashu. It flowers in April and has ripe fruits in July. The black berries contain a very viscous juice and are therefore usually not eaten. The pulp of this berry is purplish green. The seeds, usually 1 or 2, are black. It is a frequent evergreen tree of the open bush of the lowveld and yields a good timber. The native doctors use a cupful of the rootbark as an enema to produce a drastic perspiration.

* In the accompanying illustrations the drawings of flowering branches are half natural size (linear).

2. *Chrysophyllum natalense* Sond., the Natal sweet plum, is found as a small tree or as a kind of undershrub in the mistbelt-forests of the East Coast. The red drupes are very delicious. The excellent timber is used for poles. The Zulu name is umTongwane. This name is used also for another tree *Oncoba spinosa* Forsk. of the dry bushveld. The Zulus rightly distinguish, therefore, between umTongwane wehlathi, i.e. of the forest, and umTongwane wehlanze, i.e. of the open bushveld.

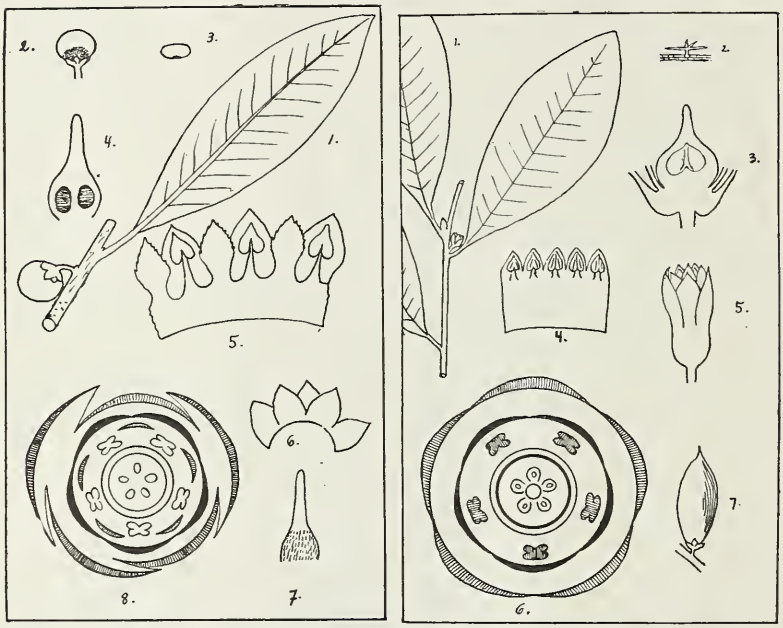


Fig. 1. *Sideroxylon inerme.* 1. Branchlet with leaf and fruit. 2. Berry showing the position of the seed. 3. Seed. 4. Ovary in vertical section. 5. Part of the corolla tube expanded. 6. The calyx expanded. 7. Ovary with style. 8. Flower diagram.

Fig. 2. *Chrysophyllum natalense.* 1. Branchlet with leaves and flower. 2. Hair enlarged. 3. Vertical section through the ovary. 4. Corolla tube expanded. 5. Flower. 6. Flower diagram. 7. Fruit.

3. *Chrysophyllum viridifolium* Wood & Franks.

This is quite frequent in the closed mist belt forests of the first terrace. In the Eshowe forest in particular it is the king of the trees, having usually a straight trunk of 100 ft. or more and the shape of an old *Pinus pinaster*. The berries have the shape of a little apple with a yellow skin (exocarp), a yellowish-whitish pulp (mesocarp) and five brown seeds. The pulp

is saturated with a sticky white latex, which makes the fruits not very palatable although they are sweet and edible. They can be found ripe and fallen off from the tree in February and March. This is also the best time to recognize this tree in the forest. The royal timber is very much appreciated. Its Zulu name is umG(w)inya or amaSetole amakulu ehlathi.

4. *Chrysophyllum magalismontanum* Sond. is widely distributed in the Transvaal and is called Stamvrugte. In Natal it occurs only on the Transvaal border along and between the middle Mkuzi and Pongola Rivers. The Zulus call it there amaNumbele, the Shangaan umBovanhlathi, and all Sothos Motlhatswa. It occurs often in shrub form. The fruits are edible. Synonym : *Chrysophyllum Wilmsii* Engl.

5. *Labourdonnaisia discolor* Sond. (= *Mimusops discolor* Hartog). Genus prius restauratum et completum :

Arbor media (diam. circ. 60 cm.), altitudine 10—20 m., cum latice albo et cortice cinereo. In trunco vetere magis in longitudinem quam in latitudinem fissa, in brachiis parvis cortice levi et cicatricoso. Forma eius similis Piri sed amplius ramosa. Folia alterna, obovata, oblonga, petiolo subterete (1—1·2 cm.). Laminarum longitudo circ. 6·5 cm., latitudo circ. 2·5 cm. in loco non nimis sicco. In loco sicco lamina minora. Lamina coriacea, supra viridis, subter tomentosa nitens sicut argentum, basi cuneata, apice recurvato, apiculato noma emarginato, costa subtus prominente tomentosa, nervis lateralibus immersis. Flores infra folia ramulorum, pedicello 5—10 mm., calice duplici trilobato ($\frac{1}{2} \times \frac{1}{2}$ cm.). Lobi externi calicis lati, ovati, apice acuminato, subter rubiginosi et verrucosi, supra lutei, subglabri. Lobi interni calicis angustiores lanceolati, subter et supra flavi et pilosi. Perianthii segmenta in flore perfecto interiora 6 lanceolata-lineata, simplicia, exteriora 6, latiora, bilobata lobis acuminatis. Forma perianthii variat considerabiliter in flore imperfecto et tempore adverso. Itaque flores alii habent tantum 6 lobos simplices noma apiculatos, noma tridentatos, noma trilobatos, faciliter marcescentes et complicantes. Lobi omnes flavi, virescentes et pilosi. Stamina 12, 6 opposita et 6 alternantia lobis interioribus. Antherae caducissimae, luteae, cordatae. Filamenta albida. Stylus virescens ad apicem, paululum exsertus, stigmate sexlobato. Ovarium pilosum, sexloculare. Fructus bacca sphaerica cum pistillo persistente, exocarpo rufo, sarcocarpo succoso, edulis, sapore jucundissimo.

Labourdonnaisia discolor is a medium-sized tree, growing 10—20 m. high and having a diameter of about 60 cm. It has a white latex. The grey bark is longitudinally fissured. On young branches the bark is more smooth and full of leaf-scars. The shape of this tree is that of a Pear tree, but more branched. The leaves are alternate, obovate-oblong. The petiole

is subterete and 1—1·2 cm. long. The blade is about 6·3 cm. long and about 2·5 cm. broad, green above, silvery-pubescent below. The midrib is prominent below, the lateral veins immersed, the base is cuneate, the apex recurved and acuminate or emarginate. The little fascicles of flowerlets are in the axils of the leaves. The pedicel is 5—10 mm. long. The double calyx is trilobate. The single lobe is $\frac{1}{2} \times \frac{1}{2}$ cm. in size. The calyx-lobes are fulvo-verrucose below, yellowish and smoother above. In a perfect flower the corolla tube has six lanceolate-lineate inner lobes and six larger deeply bilobate outer lobes. They are all greenish-yellow and hairy and vary considerably in form and size if the flowers are not perfectly developed, some being then simple, some tridentate and some trilobate. They wither and wrinkle very easily. There are 12 stamens, 6 opposite and 6 alternating with the inner corolla-lobes. The cordate-shaped anthers very easily fall off and are of brownish-yellow colour. The filaments are lighter coloured. The style is a little exerted. The stigma is minutely 6-lobed and the ovary is 6-locular. The berry is red and globose with the persistent style at the top. The pulp is juicy and has a good flavour. It would give a very good jam. The timber is excellent and termite-proof.

As this genus has not all the features of the genus Mimusops, differing in the double number of stamens, the lack of staminodes, the bilobate outside lobes of the corolla-tube, the variability of the perianth-lobes generally in imperfect flowers and the fixed and very reduced corolla-tube, the restoration of its first genus-name "Labourdonnaisia" seems to me neccssary. It is usually found on the Ecca-series-sandstone in the transition-region of closed to open bush, most frequently in the Hlabisa District, but all through the coastal districts of Natal right north to the Mangusi Forest of the Ingwavuma District. It is called by the Zulus "umNweba," i.e., "the white shining thing," because the bark of the umNweba twigs shows, if peeled off, a kind of white wool, probably

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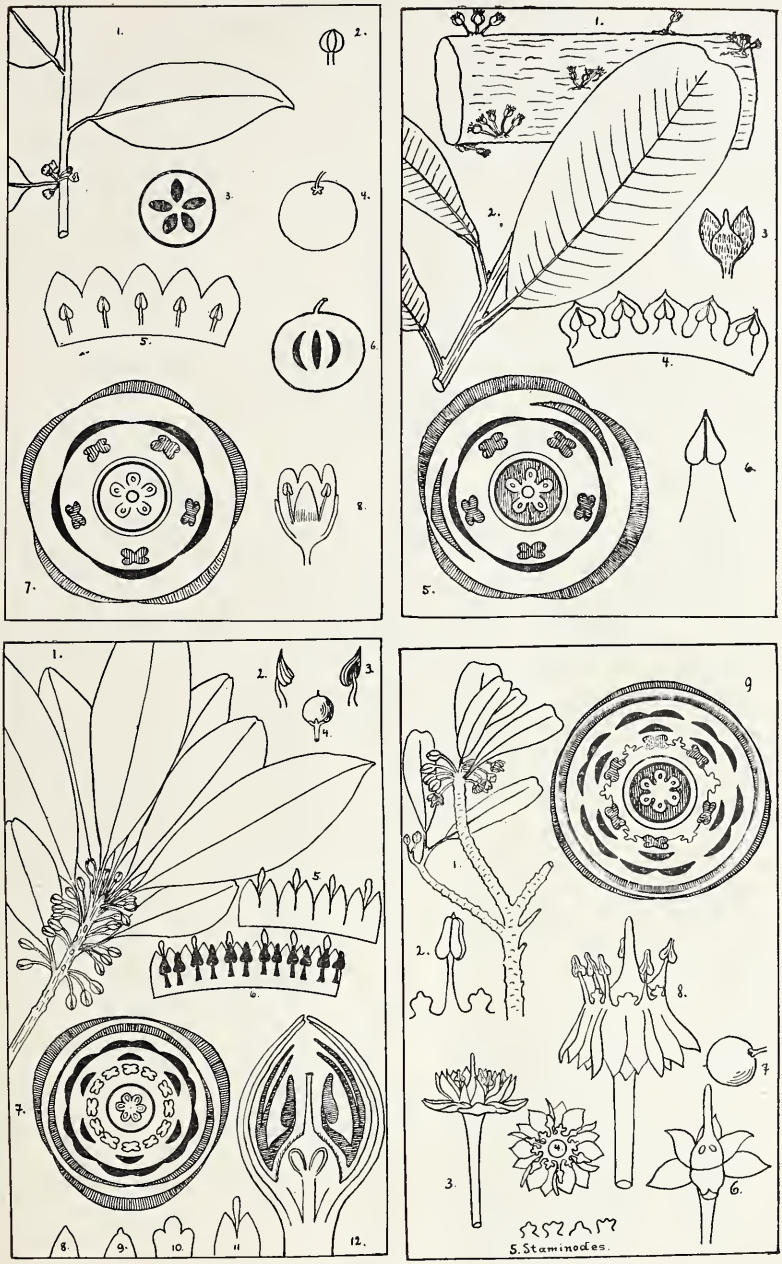
Fig. 3. *Chrysophyllum viridifolium*. 1. Branchlet with flowerlets. 2. Flower bud. 3. Horizontal section through the fruit, diagrammatic. 4. Fruit. 5. Perianth-tube expanded. 6. Vertical section through fruit. 7. Flower-diagram. 8. Vertical section through flower.

Fig. 4. *Chrysophyllum magalismontanum*. 1. Part of an older branch with flowers. 2. Younger branch with leaves. 3. Ovary with part of calyx. 4. Corolla-tube expanded. 5. Flower-diagram. 6. Stamen.

Fig. 5. *Labourdonnaisia discolor*. 1. Flowering branchlet. 2 & 3. Stamens. 4. Fruit. 5. Part of the corolla-tube expanded and seen from outside. 6. Corolla-tube expanded and seen from inside. 7. Flower-diagram. 8—11. Four different variations of the corolla-lobes. 12. Vertical section through a flower-bud, diagrammatic.

Fig. 6. *Mimusops concolor*. 1. Flowering branch. 2. Stamen with two staminodes. 3. Flower enlarged. 4. Corolla tube seen from top. 5. Different varieties of staminodes. 6. Flower without corolla-tube. 7. Fruit. 9. Flower diagram.



FIGS. 3—6.

the coagulated guttapercha. In using this native name we must remember that there are three kinds of umNweba : umNweba olwandhle, the umNweba of the sea, *Mimusops caffra* ; umNweba wentaba, the umNweba of the hills, *Labourdonnaisia discolor* ; and umNweba wehlathi, the umNweba of the Ngome forest, *Gymnosporia acuminata Szysz.*

It flowers usually in September and October. The fruits are ripe in December or later, and are the most delicious wild fruits which I have ever tasted in Africa. In 1938 I found the flowers of this species not fully developed, but in October 1943 I received from the same place perfect flowers, which I have described above.

6. *Mimusops concolor* Harv. ; the Zulu Standard name of this tree is " amaSetole amhlope." It is a tree or often a shrub of the dry bushveld preferring Sandstone formations. The Tonga name is umNqambo. This termite-proof tree yields very good poles and excellent timber. The shape is usually that of a Pear tree.

7. *Mimusops mochisia* Baker, a tree of the nothern bushveld, especially round Ndumo and the Nyamini-pan. It grows about 30 ft. high, has a whitish rugose bark and the shape of an apple or even a willow. The Tonga name is also umNqambo. I found in summertime no fruits or flowers on it. Its very crooked branching is typical. The leaves are deciduous and dull like *Mimusops concolor,* but larger. According to Sim the yellow fruit is of the size of a bullace containing four seeds. May be only a tropical form of *Mimusops concolor.*

8. *Mimusops caffra* E. Mey. Its Zulu name is uMakayi, i.e. the duiker's hair brush, on account of the similarity of the opening flower to the tuft of hair on the head of the duiker. It is an excellent timber. Another more general and ambiguous name is the Zulu name " umTunzi," the Shade tree. Chief John Dunn administered justice to the natives under this tree at his residency at the Umlalazi lagoon. Hence the township there is now called emTunzini. The fruit is edible and well-flavoured. The exocarp is orange coloured, the mesocarp contains a starchy sweet pulp. This tree is often dominant in the sand dune bush of the coast, where it is usually the staple food of the monkeys, which spread this tree not digesting the hard black seeds. In the forest at the Inyoni River

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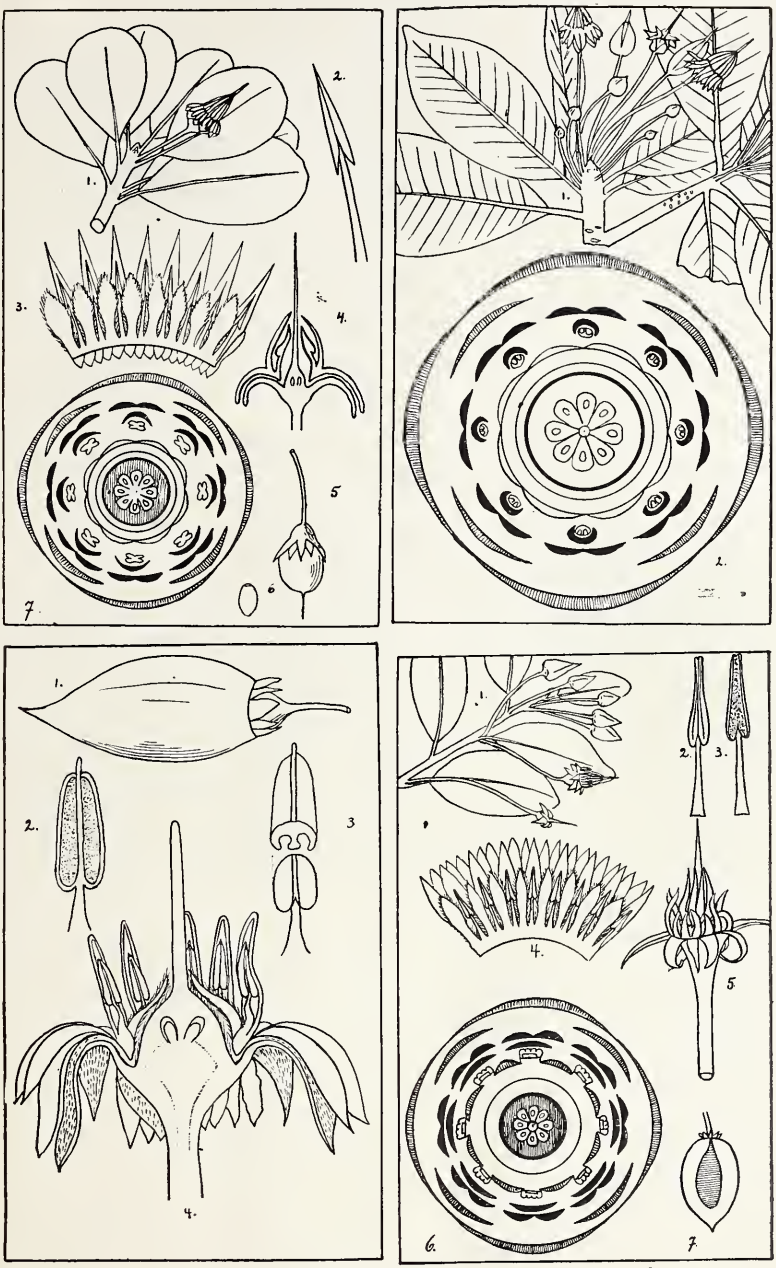
Fig. 7. *Mimusops caffra.* 1. Twig with leaves and flower. 2. Stamen. 3. Corolla-tube expanded. 4. Vertical section through flower. 5. Fruit. 6. Seed. 7. Flower diagram.

Fig. 8. *Mimusops marginata.* 1. Branch top with leaves and flowers collected at 1/9/43 at Nongoma. 2. Flower diagram.

Fig. 9. *Mimusops marginata.* 1. Fruit. 2. Stamen seen from outside. 3. Stamen seen from inside with horizontal section. 4. Whole flower in vertical section.

Fig. 10. *Mimusops obovata.* 1. Twig with flowers and leaves. 2 & 3. Stamens seen from inside and outside. 4. Corolla tube expanded. 5. Flower. 6. Flower diagram. 7. Fruit in vertical section.



FIGS. 7—10.

mouth 75% of the trees are *Mimusops caffra*. At Sordwana Bay it gets even the direct spray of the surf. The afforestation of the many thousands of acres of shifting sands along the Zululand coast seems to me not impossible if the soil is prepared in a wet season by planting first sugar cane and then between the cane rows planting out the trees when about 3 ft. high in cheap containers. A mixed forest of *Mimusops caffra* E. Mey., *Brachylaena discolor* DC., *Olea woodiana* Knobl. and *Casuarina equisetifolia*, would give an evergreen bush and yield excellent timber. Monkeys, bucks and birds would soon create an association of undershrubs as well, if they get a chance.

9. *Mimusops marginata* N.E.Br., a forest tree and royal timber, which grows in mist-belt forests and in closed river bush. Its Zulu name is umPumpulo and the fruits, which are not eaten by man, are called amaPumpulo.

10. *Mimusops obovata* Sond., the red Milkwood, Rooi Melkhout, is a tree of the closed mistbelt forests, but found as well in the bushveld along the more closed bushes especially in kloofs. Its tasty red fruits are edible and very much appreciated if ripe. The royal timber is termite-proof. The Standard Zulu name is "amaSetole ambomvu," the Swazi name is umPushane, another more general Zulu name is umTunzi, Sim gives as Natal name isiPandane. It flowers from August to October and is fertilized by humble bees. I found a half a dozen of these humble bees on one shrub. It is the most frequent Mimusops of the country, growing along the Riverbushes near the sea in all forests and on good soil as well as on pure rocks, and it is not surprising that it varies very much in appearance of leaves and way of flowering. In shady places of the forests we find tender leaves and few flowers, on rocks in sunshine more coriaceous leaves and plenty of flowers. No wonder that there are quite a number of synonyms : *Mimusops Rudatisii* Engl. and Krause ; *Mimusops oleifolia*, a poor bushveld form ; *Mimusops Woodii* Engl., probably a mistbelt form ; probably also *Mimusops blantyreana*, a more tropical form.

11. *Mimusops Zeyheri* Sond., the Moepel, which all Sothos call moPudu and the Vendas Mubululu. It is a royal timber of the western Transvaal and Betchuanaland bushveld. The leaves are on both sides dull greyish-green. It flowers in January. The fruits are edible and very tasty and vary very much in size and shape from sub-globose to egg-shaped. They are ripe in November.

12. *Mimusops Henriquesiana* Sim. I recorded this at False Bay without flowers or fruits. It has more copious Guttapercha-latex than other species.

13. *Mimusops Schinzii* Engl. may occur as well in northern Zululand,

but has not yet been found. Cf. Henkel, woody plants of Natal and Zululand.

14. *Mimusops Kirkii* Bkr. f. was recorded from Magoeba's Kloof, North Transvaal. *Cf.* Gerstner 5881, National Herbarium.

15-18. There are four other species of Mimusops of Southern Rhodesia, which possibly may occur in the Limpopo-valley of Northern Transvaal : *M. decorifolia* S. Moore. *M. Monroi* S. Moore. *M. spiculosa* Hutch. & Corb. *M umbraculigera* Hutch. & Corb.

RESERVE CARBOHYDRATES IN SOUTH AFRICAN GRASSES.

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(With Plate III.)

Figures in parentheses, see References at end of this article.

The significance of carbohydrate reserves in certain South African grasses has been discussed in various previous papers (12-15). The results of sugar and starch determinations led to the conclusion that these materials are the more important types of reserve carbohydrates in the species investigated. In recent years considerable attention has been focussed on the occurrence of fructosans in grasses and other monocotyledons (1, 4). Sullivan and Sprague (11) point out that fructosans may often have been reported as starch and dextrin, and consider that fructosan, rather than starch, is important as a reserve carbohydrate in grasses. As a contribution to the ultimate settlement of these controversies, the writers have now carried out detailed carbohydrate analyses on the roots, rhizomes and shoots of a number of important indigenous South African grasses, involving the determination of reducing and non-reducing sugars, fructosan, dextrin and starch in these materials. Carbohydrate analyses of various exotic grasses were included.

Material.

Roots and *Rhizomes.*—The species from which root and rhizome samples were taken are listed in Table I, together with data regarding localities and times of sampling. Wherever possible, the samples were taken from protected plots, and during autumn or winter, so as to ensure a high content of reserves. A number of plants of each species were dug up to a depth of at least four to six inches. The bulk of the adhering soil was removed by washing or shaking, and as soon as possible the material was taken to the laboratory, where it was killed by autoclaving at 5 lb. pressure for five minutes. The samples were then dried at a temperature of 50° to 60° C., cut up, ground and stored in air-tight bottles for chemical analysis.

TABLE I.

Roots and Rhizome Materials Investigated.

Species.	Sampling Date.	Locality.
Brachiaria serrata	8th August, 1942	Natural veld; plots protected from grazing for four seasons; old herbage removed by cutting every year in mid-winter.*
Elyonurus argenteus	19th June, 1942	
Eragrostis chalcantha	7th August, 1942	
Harpechloa falx	8th August, 1942	
Microchloa caffra	19th June, 1942	
Monocymbium ceresiiforme ..	21st June, 1942	
Trachypogon plumosus	16th June, 1942	
Tristachya hispida	18th June, 1942	
Digitaria tricholaenoides ..	10th August, 1942	Moderately grazed plots.*
Cynodon dactylon, Friel's Selection	13th July, 1943	Turf plot, protected for two years.*
do., Wild Kweek grass	25th Sept., 1944	Intensively grazed Cynodon pasture.*
Hyparrhenia hirta	6th July, 1945	Protected plot, burnt every alternate year in winter since 1931.†
Themeda triandra	6th July, 1945	
Agrostis tenuis	21st March, 1945	6 to 10-year-old nursery plots.*
Arrhenatherum elatius	19th March, 1945	
Lolium perenne	19th March, 1945	
Phalaris arundinacea	21st March, 1945	
Chloris gayana	10th July, 1945	Plot protected for two seasons.*
Paspalum dilatatum	10th July, 1945	
Pennisetum clandestinum ..	10th July, 1945	

* Botanical Research Station, Frankenwald, near Johannesburg.
† Crescent Creek Experimental Plots, Johannesburg.

Shoots.—During the season 1943-44 herbage samples of four species of grasses were collected in one of the experimental plots of the Witwatersrand University at Crescent Creek, Johannesburg. This plot had been burned every alternate year in June since 1931, but remained protected from any other interference. Cook (3), examining the plot in 1937, found that its vegetation had not changed appreciably since the first burn.

For the present investigation *Brachiaria serrata*, *Hyparrhenia hirta*, *Trachypogon plumosus* and *Themeda triandra* were chosen as test materials.

Herbage samples of these species were collected on 24th November, 1943, 15th February, 1944, 18th April, 1944, and 28th June, 1944. The last burn to which the plot was subjected before these samples were taken took place on 30th June, 1943. Information concerning the growth stage of the individual species on the sampling dates is given in Table II.

Table II.

Phenological Observations.

Sampling Date.	24th Nov., 1943.	15th Feb., 1944.	18th April, 1944.	28th June, 1944.
Brachiaria serrata	Leaves and stems; inflorescences formed	End of flowering period; inflorescences lost	All stems and most leaves dead	All aerial parts dead.
Hyparrhenia hirta	Leaves only formed	Flowering stage	Seeds being formed; yellowing	Do.
Themeda triandra	Inflorescences formed	End of flowering period; inflorescences still present	Leaves partly brown	Do.
Trachypogon plumosus	Leaves; stems being formed	End of flowering period; inflorescences lost	Leaves partly brown	Do.

The samples were always taken in the morning between nine and ten o'clock, and were killed immediately by autoclaving. The matérial was then dried and ground in the same way as the root and rhizome materials.

Analytical Methods.

Sugars.—Sugars were extracted from 2·5-gram samples of the air-dry material by heating with 100 ml. of 95 per cent. alcohol for two hours. Some calcium carbonate was added to prevent acid hydrolysis during extraction. The alcohol was removed from the filtrate by distillation under reduced pressure, the remaining syrup taken up with water, cleared with neutral lead acetate, made to 100 ml. volume, and de-leaded with potassium oxalate. A 25-ml. aliquot was hydrolyzed by heating for half

an hour on a boiling water bath with 1·25 ml. of 25 per cent. hydrochloric acid. The reducing power of the sugar extracts was determined by a previously described semi-micro method (16). The latter was also used to estimate the reducing power of the other carbohydrate extracts prepared in this investigation.

Fructosans and Dextrins.—The residue from the sugar extraction was dried at 50 to 60° C., and transferred to a 500-ml. Erlenmeyer flask. 100 ml. of distilled water and a few drops of toluene were then added, and the mixture was agitated for two hours on a shaking apparatus. The liquid was filtered under suction through a dry filter on a Buchner funnel, without washing : 50 ml. of the aqueous extract were pipetted into a 250-ml. Erlenmeyer flask, and to these were added 20 ml. thymol-saturated acetic acid-sodium acetate buffer solution, pH 4·45, and 5 ml. of dialyzed takadiastase solution (corresponding to 25 mg. of original takadiastase, Parke, Davis & Co., Detroit, U.S.A.). The flasks were then tightly stoppered and incubated for 44 hours at 37 to 38° C. for the digestion of dextrins. At the end of the digestion period 1·1 ml. of 25 per cent. hydrochloric acid were run into the digests, and the flasks heated for half an hour on a covered bath of boiling water to hydrolyze fructosans (the liquid in the flasks reaching a temperature of approximately 75° C.). The hydrolysates were cooled down, three-quarters of the acid was neutralised with a pre-determined quantity of strong sodium hydroxide solution, the liquid was transferred to a 100-ml. flask, cleared with neutral lead acetate and made to volume. The filtered liquid was then neutralized with solid sodium carbonate to a pH of 5·0 to 5·5, the pH being checked by a Beckman pH meter, after which the solution was de-leaded with solid potassium oxalate.

For the determination of fructosans a modification of the colorimetric method developed by Roe (10) and Hubbard and Loomis (6) for blood and urine analyses was used. The method is based on the fact that fructose when heated with a solution of resorcinol in the presence of concentrated hydrochloric acid gives a red colour, the intensity of which, within certain limits, is proportional to the fructose concentration. One ml. of a 1 per cent. solution of resorcinol in 95 per cent. alcohol was added to 1 ml. of the cleared and de-leaded filtrate in a graduated test-tube, followed by 3 ml. of 30 per cent. hydrochloric acid. After being shaken to ensure adequate mixing, the tubes were heated for exactly eight minutes in a water-bath maintained at 80° C., and then rapidly cooled in running water. The resulting coloured solutions were made up to the volume of 5 ml. with 95 per cent. alcohol, after which they were compared in a Dubosque colorimeter with a standard fructose solution which had been treated simultaneously with the filtrates by

the same procedure. The method was tested on pure fructose solutions over a range of 0·02 to 0·4 mg. per ml., and found to give results accurate to well within 5 per cent. of the expected value. Concentrations below 0·02 mg. per ml. gave a colour that was still detectable, but not measurable in the Dubosque colorimeter. Superior sensitivity would probably be achieved with a photo-electric colorimeter.

Interference due to the presence of glucose was investigated in a series of experiments. It was found that concentrations lower than 1 mg. glucose per ml. did not produce a measurable colour. The fructose equivalent of higher concentrations of glucose (concentrations up to 50 mg. per ml. were tested) tended to vary slightly. The average figure for the apparent fructose value of 1 mg. glucose was 0·006 mg. Wherever discrepancies between total sugar estimations and fructose determinations indicate that more than 1 mg. glucose is present per ml., therefore, corrections for glucose should be made. These were unnecessary in the present investigation as the glucose concentration never approached 1 mg. per ml.

In order to estimate the possible interference by chromogens other than reducing sugars, McRary and Slattery (8) in a recent paper recommend fermentation of the hydrolyzed extracts previous to treatment with resorcinol. In the present investigation several extracts were subjected to rapid fermentation with baker's yeast (17). The fact that colourless solutions were subsequently obtained on heating with resorcinol indicated, firstly, that all the chromogens present in the solutions were fermentable, and, secondly, that no complex polysaccharides capable of being hydrolyzed to chromogens under the strongly acid conditions obtaining for colour development were present.

It should be noted that some extracts were observed to yield deep-red solutions when heated with concentrated hydrochloric acid even in the absence of resorcinol. The presence of alcohol, however, inhibited this colour formation, which thus did not interfere with the estimations.

From the results of the determinations of fructose and of the total reducing power, the fructosan and dextrin content of the samples was calculated, taking into account the weight increase of these substances upon hydrolysis as well as the lower reducing power of fructose as compared with that of glucose (16).

Starch.—The residue from the water extraction was thoroughly washed, and, following the usual gelatinization treatment, was digested with 3 ml. saliva for 20 hours at 37 to 38° C.; 50 ml. of the cleared and de-leaded digest were hydrolyzed with 4 ml. of 25 per cent. hydrochloric acid in an autoclave at 15 lb. pressure for one hour. Starch was calculated by multiplying the glucose value by the factor 0·9.

Ash and Dry Matter.—Dry matter determinations were carried out on all samples, and in roots and rhizomes the ash content was determined in addition. The analytical results were reported as percentages of the dry matter in the case of the shoots, and as percentages of the ash-free (combustible) dry matter in the case of the roots and rhizomes. Errors due to variations in the amounts of sand and soil adhering to the underground parts were thus eliminated.

Discussion of Results.

I. Reserve Carbohydrates in Underground Parts.

The results of the carbohydrate determinations in roots and rhizomes are given in Table III. As will be seen from these figures, reducing sugars occurred only in small amounts in most materials. Exceptions were the roots of *Elyonurus argenteus* (1·04 per cent.) and *Chloris gayana* (2·24 per cent.), and the roots and rhizomes of *Pennisetum clandestinum* (4·95 and 2·81 per cent. respectively). Non-reducing sugars, on the other hand, were found in appreciable amounts in the majority of the materials investigated. In 12 out of the 14 root samples of indigenous South African species, non-reducing sugars occurred in larger amounts than did the other types of carbohydrates. Amongst the exotic species this was the case only in *Paspalum dilatatum* and *Pennisetum clandestinum*, both species being indigenous to tropical countries. While considerable quantities of non-reducing sugars were also recorded in most of the rhizomes, it was only in those of *Digitaria tricholaenoides* that these compounds were present in excess over the other reserve carbohydrates.

No significant amounts of fructosans were found in the roots and rhizomes of any of the indigenous South African grasses, the highest concentration being reached in *Chloris gayana* with 0·70 per cent. Fructosans were, however, abundant in the roots of all the exotic grasses investigated. In the roots of four of the exotic species studied fructosans constituted the principal carbohydrate. These species were *Agrostis tenuis*, *Arrhenatherum elatius*, *Lolium perenne* and *Phalaris arundinacea*, all indigenous to cool temperate climates. The occurrence of fructosans in these, or closely allied, species has been reported by previous workers (1, 4, 11). Particularly large amounts of fructosans were found in the rhizomes of *Agrostis tenuis* and *Phalaris arundinacea* (viz., 17 and 31 per cent. respectively).

Dextrins were generally found to be either absent or occurring only in very small quantities. It may be not without significance that the presence of somewhat larger amounts of dextrins was usually associated with a high starch content (roots of *Cynodon dactylon*, wild Kweek grass,

TABLE III.

Reserve Carbohydrates in the Underground Parts of Grasses.

Expressed as percentages of the combustible dry matter.*

Species.	Red. Sugars.	Non-red. Sugars.	Fructo-sans.	Dex-trins.	Starch.	Total.
Indigenous South African Grasses.						
Roots.						
Brachiaria serrata ..	0·15	**6·30**	0·00	0·00	0·13	6·58
Chloris gayana	2·24	**4·69**	0·70	0·09	0·03	7·75
Cynodon dactylon :						
Friel's Selection ..	0·06	1·65	0·00	0·06	**1·99**	3·76
Wild Kweek Grass † ..	0·28	**6·05**	0·34	0·42	5·86	12·95
Digitaria trichol. ..	0·48	**6·20**	0·26	0·18	0·18	7·30
Elyonurus argenteus ..	1·04	**6·90**	0·34	0·34	0·28	8·90
Eragrostis chalcantha ..	0·08	**2·68**	0·00	0·00	0·13	2·89
Harpechloa falx	0·19	**2·50**	0·20	0·28	1·15	4·32
Hyparrhenia hirta ..	0·85	**10·50**	0·57	0·00	0·29	12·21
Microchloa caffra ..	0·03	**1·90**	0·00	0·00	0·13	2·06
Monocymbium ceres. ..	0·21	**4·51**	0·00	0·00	0·14	4·86
Themeda triandra ..	0·19	**8·75**	0·41	0·00	0·04	9·39
Trachypogon plumos. ..	0·08	**3·76**	0·00	0·00	0·14	3·98
Tristachya hispida ..	0·01	1·26	0·32	0·44	**7·73**	9·76
Rhizomes.						
Cynodon dactylon :						
Friel's Selection ..	0·12	2·50	0·55	0·87	**12·53**	16·57
Wild Kweek Grass † ..	0·23	3·90	0·20	0·72	**10·28**	15·33
Digitaria trichol. ..	0·26	**0·95**	0·00	0·28	0·41	1·90
Exotic Grasses.						
Roots.						
Agrostis tenuis	0·14	0·43	**2·61**	0·00	0·48	3·66
Arrhenatherum elatius ..	0·23	0·85	**1·92**	0·36	0·67	4·03
Lolium perenne	0·03	0·33	**3·03**	0·19	0·25	3·83
Paspalum dilatatum ..	0·46	**11·38**	1·24	0·05	0·15	13·28
Pennisetum clandest. ..	4·95	**7·41**	1·13	0·23	0·19	13·91
Phalaris arundinacea ..	0·22	1·61	**3·44**	0·00	0·24	5·51
Rhizomes.						
Agrostis tenuis.	0·61	0·64	**16·75**	0·14	0·95	19·09
Pennisetum clandest. ..	2·81	3·89	0·69	1·19	**4·78**	13·36
Phalaris arundinacea ..	0·78	3·16	**31·15**	0·54	0·63	36·26

* The most abundant carbohydrate group in each species is given in bold type.

† Analysed by Miss E. Goldsmith. Starch determined by digestion with takadiastase.

and of *Tristachya hispida* ; rhizomes of *Cynodon dactylon* and of *Pennisetum clandestinum*). The dextrin content exceeded 1 per cent. only in the rhizomes of *Pennisetum clandestinum.*

Though the analytical methods used, involving digestion with saliva, indicated the presence of starch in the roots and rhizomes of all species, only a few contained starch in large amounts and as the principal carbohydrate. The highest percentages of starch were recorded in the rhizomes of *Cynodon dactylon* (viz., 10·3 and 12·5 per cent.). A similarly high starch content, namely 13·4 per cent., has been recorded in *Cynodon dactylon* rhizomes by De Cugnac (4), whereas Julander, a recent American worker, considers that not starch but " glucosans " (i.e., dextrins) are the important form of carbohydrate reserve in this grass (7). Another instance of a high starch concentration is provided by the roots of *Tristachya hispida* (7·7 per cent.). This finding is in agreement with previous results obtained by the senior author (13, 15).

In addition to the chemical analyses, qualitative starch tests were carried out on the tissues of ten of the native species. Sections of leaves, stems, roots and rhizomes were cut, treated with iodine solution, and examined microscopically. The results are summarised in Table IV.

TABLE IV.

Results of Qualitative Starch Tests in Tissues of South African Grasses.

Species.	Leaves.	Stems.	Roots.	Rhizomes.
Brachiaria serrata	+ (1) (2)	—	—	
Cynodon dactylon	+ (1) (2)	+++ (3)	++ (6)	+++ (4)
Digitaria tricholaenoides	+ (1) (2)	++ (3)	+ (6)	++ (3)
Elyonurus argenteus	+ (1)	—	—	
Eragrostis chalcantha	+ (1)	++ (3)	+ (6)	
Harpechloa falx	+ (1) (2)	—	++ (6)	
Hyparrhenia hirta	+ (1) (2)	—	—	
Themeda triandra	+ (2)	+ (5)	—	
Trachypogon plumosus	+ (1) (2)	—	—	
Tristachya hispida	+ (1) (2)	++ (3)	++ (6)	

KEY :

— = Starch absent.
\+ = Starch present in small amounts.
++ = Starch present in moderate amounts.
+++ = Starch present in large amounts.

(1) Starch present in outer bundle sheath.
(2) Starch present in leaf sheath, at junction with node, between each fibro-vascular bundle and inner epidermis.
(3) Starch present in parenchyma of cortex and ground tissue.
(4) Starch present in parenchyma of ground tissue.
(5) Starch present in parenchyma of ground tissue at node only.
(6) Starch present in pith parenchyma.

Starch was detectable in all the species, not only in the subterranean organs, but also in the aerial parts. Where starch was present in the leaf blades, it invariably occurred in the chloroplasts of the outer bundle sheath. The colour obtained here with iodine solution was usually, however, not the typical blue, but rather a black-brown, even when the chlorophyll had been extracted with alcohol previous to testing. It is nevertheless considered that the stain was due to small amounts of starch. Typical blue starch grains were found in the leaf sheaths at the junction with the node, even in species where the iodine test gave doubtful or negative results in the leaf blades. The accumulation of starch in the plastids of the bundle sheath has been observed by Rhoades and Carvalho (9) in maize and sorghum.

The results of the qualitative starch tests on the roots and rhizomes largely confirmed those of the chemical analysis. In the three species where quantitative analysis revealed the presence of larger amounts of starch (viz., *Cynodon dactylon*, *Harpechloa falx* and *Tristachya hispida*) distinct accumulations of typically-stained starch grains were found in the tissues. Positive tests were also given by the roots of *Digitaria tricholaenoides* and *Eragrostis chalcantha*. The rhizomes of *Cynodon dactylon* were strikingly rich in starch (see Plate III).

That the results of the chemical analysis indicated very small amounts of starch in a number of species where no starch could be detected microscopically, may be due to the hydrolysis by saliva of substances other than starch (5) or else to incomplete extraction of sugars or fructosans, a small fraction of which may have remained in the residue used for the starch determination. This was most probably also the case in the roots and rhizomes of *Agrostis tenuis*, *Arrhenatherum elatius*, *Lolium perenne* and *Phalaris arundinacea*, where no starch grains could be detected, though chemical analysis indicated small quantities of starch.

According to De Cugnac (4), grasses can be divided into two groups, namely, those which accumulate in their vegetative organs sucrose with or without starch (" Graminées saccharifères "), and those which store fructosan, usually together with sucrose (" Graminées lévulifères "). De Cugnac's tentative suggestion that the latter group essentially comprises grasses native to cool temperate climates, while the " Graminées saccharifères " are mostly adapted to warm regions, seems to be confirmed by the results of the present investigation. In none of the indigenous South African grasses studied did fructosans occur in appreciable amounts. Most of the grasses contained non-reducing sugars, presumably in the form of sucrose, as their principal carbohydrate. Some contained high percentages of starch, the latter carbohydrate actually constituting the main carbohydrate reserve in several cases. General statements offered

by some workers asserting the negligible importance of starch as a reserve carbohydrate in the vegetative organs of grasses are thus shown to be not permissible, since the type of carbohydrate reserve is apparently largely a characteristic of the species concerned.

II. Seasonal Carbohydrate Trends in the Shoots of Four South African Highveld Grasses.

The results of the herbage analyses are indicated in Table V and Figure 1. The shoots of all four species examined contained reducing

Table V.

Seasonal Carbohydrate Trends in the Shoots of Four South African Highveld Grasses.

Expressed as percentage of the dry matter.

Sampling Date.	Reducing Sugars.	Non-reducing Sugars.	Total Sugars.	Starch.	Total available Carbohydrate.*
		Brachiaria serrata.			
24/11/1943	0·42	1·23	1·65	0·69	2·34
15/ 2/1944	0·43	0·99	1·42	0·30	1·72
18/ 4/1944	1·29	0·75	2·04	0·23	2·27
28/ 6/1944	0·39	0·09	0·48	0·22	0·70
		Hyparrhenia hirta.			
24/11/1943	0·68	1·68	2·36	0·70	3·06
15/ 2/1944	0·59	1·20	1·79	0·09	1·88
18/ 4/1944	1·64	1·98	3·62	0·04	3·66
28/ 6/1944	2·26	0·32	2·58	0·06	2·64
		Themeda triandra.			
24/11/1943	1·26	2·22	3·48	0·64	4·12
15/ 2/1944	0·45	2·08	2·53	0·19	2·72
18/ 4/1944	1·67	1·98	3·65	0·07	3·72
28/ 6/1944	1·05	0·25	1·30	0·13	1·43
		Trachypogon plumosus.			
24/11/1943	0·66	1·37	2·03	0·42	2·45
15/ 2/1944	0·17	0·98	1·15	0·26	1·41
18/ 4/1944	0·74	0·97	1·71	0·13	1·84
28/ 6/1944	0·63	0·29	0·92	0·31	1·23

* Total available carbohydrate = combined sugars and starch.

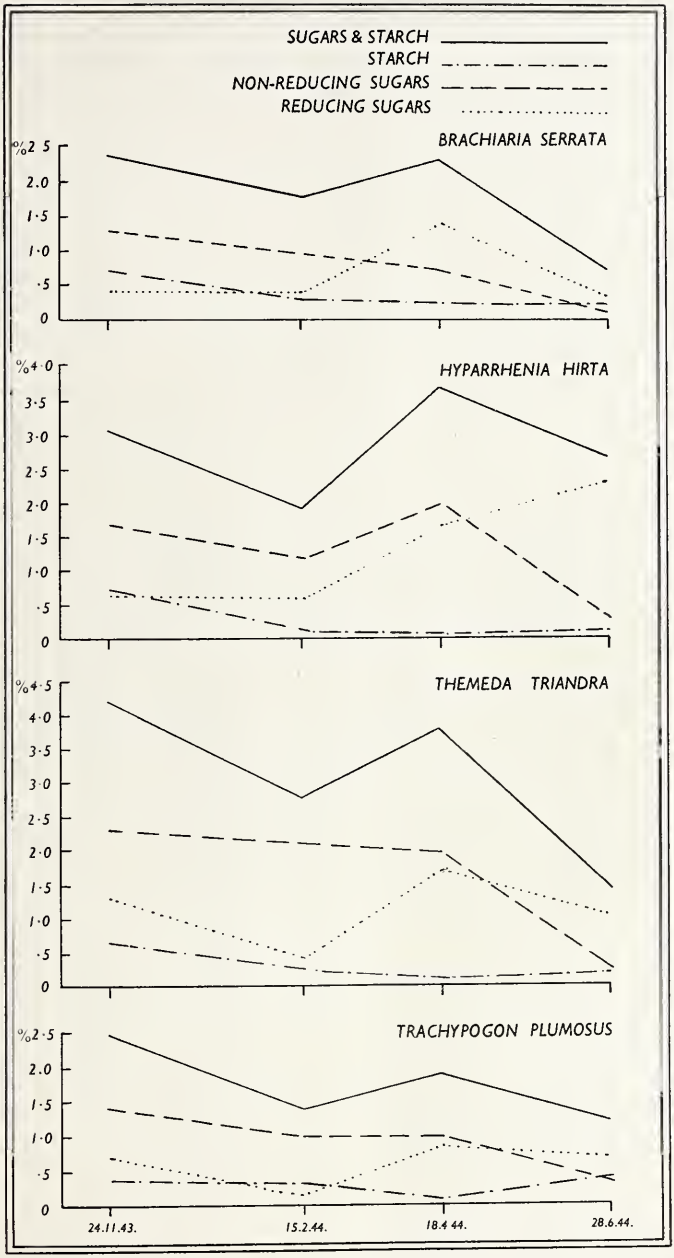

Fig. 1. Seasonal carbohydrate trends in the shoots of four South African Highveld grasses.

sugars, non-reducing sugars and starch, whereas fructosans and dextrins could not be detected in measurable quantities. There was much variation in the relative proportions of these substances, but in all instances sugars were present in larger quantities than starch. Total sugars ranged from 0·48 to 3·65 per cent., and starch from 0·04 to 0·70 per cent.

Total sugars decreased in the four species in early summer (i.e., between 24th November and 15th February) and rose again in late summer and early autumn. In three of the four species the maximum percentage of total sugars was recorded on 18th April, 1944. Starch, on the other hand, occurred in maximum amounts in all species in spring (24th November), and decreased distinctly with the advancing season, though in three species somewhat higher amounts were found in winter (28th June) than in autumn (18th April). Total sugars, as well as the combined percentages of sugars and starch, showed a distinct fall during late autumn and winter (i.e., from 18th April to 28th June).

It is known that the sugar and starch content of leaves is subject to considerable diurnal variations, largely depending on meteorological conditions influencing the rates of photosynthesis and respiration. Carbohydrates elaborated in the leaves are used to build up new tissues or are temporarily stored in the stems. While meteorological conditions prevailing on the sampling dates may have influenced the results to some extent, it is considered that the recorded changes in carbohydrates largely represent seasonal variations, since entire shoots were analysed, and not only the leaves. As considerable growth took place in all four species after the first sampling date, involving the formation of stems and inflorescences, the decrease in the percentages of sugars and starch between the first and second sampling date does not necessarily imply a decrease in amount. On the contrary, it is highly probable that these substances increased in actual amount between 24th November and 15th February. The decrease in the percentages of sugars and starch during this period is probably due to the fact that dry matter increased more rapidly in amount than did these carbohydrates. By 15th February the flowering period was over in three of the species, while *Hyparrhenia hirta* was still in the flowering stage. The flowering period marks the end of rapid expansion of the aerial parts, and is followed by the period of maturation. It is significant that during the latter stage (i.e., between the second and third sampling date) total sugars as well as combined sugars and starch increased appreciably in percentage in all four species. When conditions are favourable for photosynthesis, and no further growth is taking place, carbohydrates are elaborated in excess after flowering, and consequently increase in percentage.

When the third sample was taken (18th April) typical autumn

weather had already set in, though no frosts had occurred. The process of ageing and gradual death of the aerial portions during late autumn was associated with the loss of an appreciable portion of the accumulated sugar. Some of this sugar may have been utilised in the aerial parts in respiration or lost by decomposition, while part of it was probably translocated to the roots. As shown in earlier investigations (13), the sugar content in the roots of Highveld grasses usually increases from February onwards, i.e., soon after flowering. At this stage the excess of carbohydrates elaborated by the plant is so great that these compounds increase in percentage (and actual amount) in the aerial parts though appreciable portions are translocated to the roots at the same time. The removal of carbohydrates from shoots to roots is, however, not a complete one, as considerable amounts of sugars and starch were found in the herbage collected in winter (28th June). These ranged from approximately 30 to 70 per cent. of the amounts present in autumn (18th April). Bunting (2), who determined the sugar content of the stem bases of three grass species harvested at Frankenwald between 18th July and 6th August, 1937, obtained the following values :—

Total Sugars as Percentage of Combustible Dry Matter.

Species.	Range.	Average.
Tristachya hispida	0·89 — 9·95	2·91
Trachypogon plumosus	1·28 — 7·30	3·11
Brachiaria serrata	1·62 — 5·01	2·48

It may be assumed that the carbohydrates which are temporarily stored in the stem bases can be utilised for new growth, at least as long as these plant parts are alive. Such utilisation may occur, for instance, after mowing. Whether the residue of sugars and starch in old stems can be utilised for spring growth in the following season, is, however, not known.

Table VI and Figures 2 and 3 show the relative proportions of reducing sugars and starch. Reducing sugars, expressed as percentage of total sugars, increased in the shoots of *Brachiaria serrata* and *Hyparrhenia hirta* right through the season, and in *Themeda triandra* and *Trachypogon plumosus* at least from February onwards. Thus with the advancing season reducing sugars increased at the expense of non-reducing sugars, so that in winter the former exceeded the latter in actual amount (Fig. 1 and Table V). These changes can be interpreted as being due to increased

TABLE VI.

Relative Proportions of Reducing Sugars and Starch in the Shoots of Four South African Highveld Grasses.

Sampling Date.	*Brachiaria serrata.*	*Hyparrhenia hirta.*	*Themeda triandra.*	*Trachypogon plumosus.*
	Reducing Sugars.			
	Expressed as percentage of total sugars.			
24/11/1943	25·5	28·9	36·2	32·5
15/ 2/1944	30·3	33·0	17·8	14·8
18/ 4/1944	63·2	45·3	45·7	43·3
28/ 6/1944	81·3	87·6	80·8	68·3
	Starch.			
	Expressed as percentage of total available carbohydrate.*			
24/11/1943	29·5	22·9	15·5	17·2
15/ 2/1944	17·5	4·8	7·0	18·5
18/ 4/1944	10·1	1·1	1·9	7·1
28/ 6/1944	31·4	2·3	9·1	25·2

* Total available carbohydrate = combined sugars and starch.

hydrolysis of sucrose, and to a more rapid rate of translocation of sucrose, as compared with that of hexoses.

Starch, expressed as percentage of total available carbohydrate,* decreased in three of the four species between 24th November and 18th April, and in *Trachypogon plumosus* between 15th February and 18th April. This indicates that starch synthesis was most active during the early stages of growth and gave way to hydrolysis of starch with ageing and maturation. In winter, however, there was an increase in the relative proportion of starch. Why the winter starch content of the dry matter in three of the four species exceeded that in autumn (Table V and Fig. 1), is difficult to explain. Though it is possible that during late autumn and early winter some starch was formed from sugars or by the break-down of more complex polysaccharides, it is more likely that these fluctuations were due to sampling or other errors, particularly since the percentages of starch were in most instances very small.

* " Total available carbohydrate ", in this case, means combined amounts of sugars and starch, since fructosans and dextrins were absent.

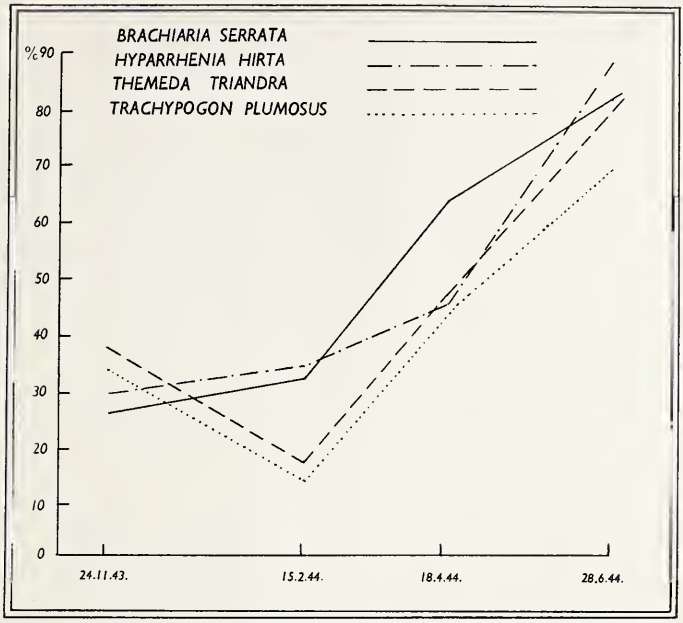

FIG. 2. Reducing sugars in the shoots of four South African Highveld grasses (expressed as percentage of total sugars).

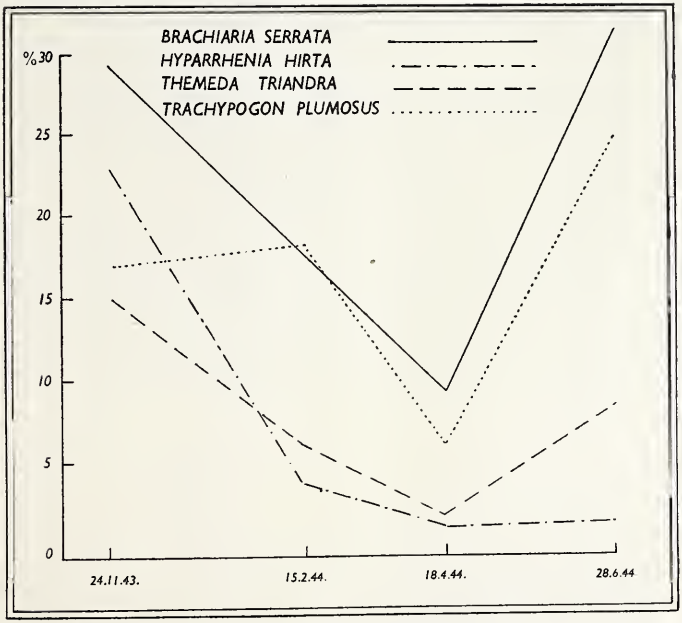

FIG. 3. Starch in the shoots of four South African Highveld grasses (expressed as percentage of total available carbohydrate).

Summary.

The results of carbohydrate determinations on the roots and rhizomes of thirteen indigenous South African grasses and of six exotic grasses are reported and discussed. Reducing and non-reducing sugars, fructosans, dextrins and starch were estimated in this material.

In the majority of the South African species investigated, non-reducing sugars formed the principal reserve carbohydrate, while in some starch occurred in largest amounts. Results of qualitative tests for starch in sections confirmed the presence of this carbohydrate in both aerial and underground parts of a number of species.

None of the South African species studied was found to contain appreciable amounts of fructosans or dextrins. The presence of considerable quantities of fructosans was confirmed in four of the exotic grasses in which fructosans had previously been reported.

Seasonal carbohydrate trends were investigated in the shoots of four indigenous South African grasses. The shoots of all four species were found to contain reducing sugars, non-reducing sugars and starch, but no fructosans or dextrins ; sugars were present in larger amounts than starch.

Total sugars, as well as combined sugars and starch, increased in the shoots of these grasses after flowering, and decreased during maturation, i.e., in autumn and early winter. The results suggested that carbohydrates are elaborated in the leaves in excess after flowering, and are consequently translocated to the roots, though considerable portions of sugars and starch remain in the aerial parts during winter.

A new technique of estimating fructosans and dextrins is described.

Acknowledgments.

The writers wish to express their sincere thanks to Professor John Phillips, Head of the Department of Botany, University of the Witwatersrand, for having provided the facilities which made this research possible.

Thanks are also due to Miss E. Goldsmith and Miss N. Katz for their co-operation, and to Mr. A. Salbany for the photographs.

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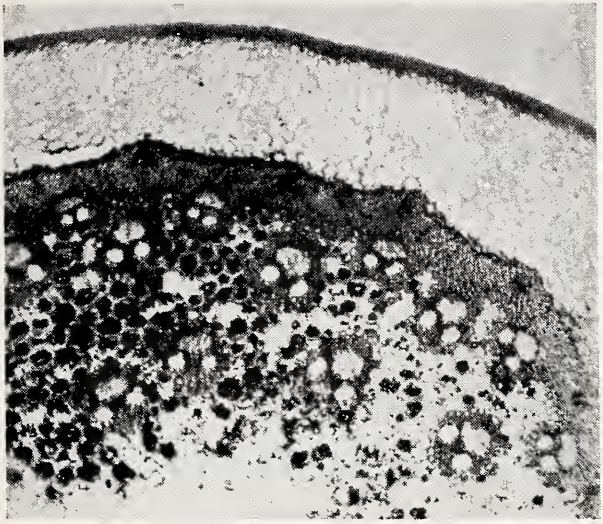
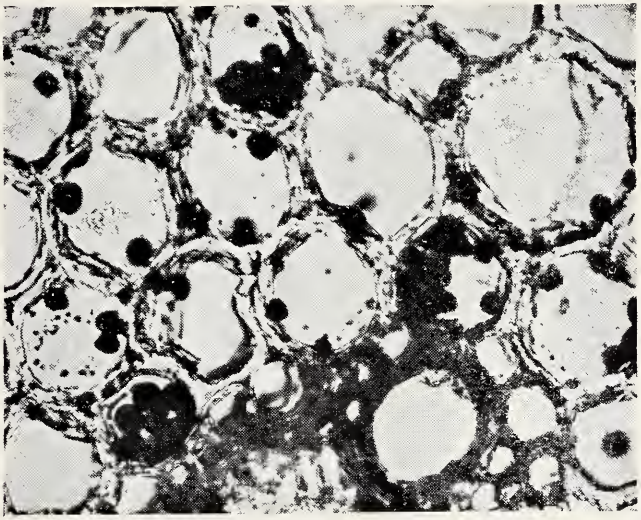


Micro-photograph of transverse section of rhizome of *Cynodon dactylon*, stained with iodine solution (magnification 92 ×). The section was so cut as to decrease in thickness from left to right. The intact parenchymatous cells of the ground tissue on the left are densely packed with starch grains, in the right-hand part many starch grains have fallen out so that individual starch grains can be seen in the cells.



Micro-photograph of transverse section of rhizome of *Cynodon dactylon*, stained with iodine solution (magnification 510×). Showing individual starch grains in parenchymatous cells of the ground tissue.

PLATE III.

REVIEWS AND ABSTRACTS.

A. W. Sampson: Plant Succession on Burned Chaparral Lands in Northern California. University of California Bull. 685, 1944. 144 pp., 46 figs., 17 tabs.

This bulletin will be of particular interest to those who are concerned about veld-burning in the sclerophyll scrub vegetation of the South-western Cape, because many of the problems associated with burning of chaparral vegetation in Northern California are analogous to those encountered here. The author is Professor of Forestry at the University of California and Plant Ecologist at the California Agricultural Experiment Station. He is an authority on the management of pasture lands, and has conducted studies of succession on burned chaparral areas over a period of fifteen years.

The bulletin is introduced by a brief description of ecological characteristics of chaparral vegetation followed by a historical résumé of burning practices. The chaparral, like the sclerophyll scrub of the Cape, was burnt by indigenous races before European settlement. Sampson considers, however, that the burning was not sufficiently extensive or frequent to have a marked effect on the vegetation. Burning apparently reached maximum proportions through the activities of the white settler, in the eighties, but has since somewhat decreased through enforcement of improved legislation. The State Board of Forestry does not attempt complete protection of all lands under its control. Three vegetation zones are recognised. Zone 1 consists of the more valuable timber and water-shed lands, and also includes state parks and monuments, as well as other such areas subject to serious economic loss by fire. The lands in Zone 2 are less important in the matter of fire protection. They form a "buffer" zone. Zone 3 includes grassy valleys and agricultural lands, which are chiefly of local interest.

From a study of the literature Sampson concludes that no single criterion may safely be used to predict the outcome of burning. "An unusually dry or wet season preceding or following burning may unpredictably affect the plant population of burned areas. The seed of some inconspicuous plant which has accumulated in the soil for many years may germinate in large numbers under the suddenly changed conditions brought about by burning, and thus result in the conspicuous presence of that particular species after the fire. Only as a result of

careful study in a particular area, taking into account all possible biotic, climatic and topographic factors, can rational prediction of plant succession be made." This conclusion applies equally well to the sclerophyll scrub of the Cape.

The main portion of the bulletin is devoted to the results of sample plot and other studies of plant succession on burns. Many of these results will be of considerable interest to Cape botanists and numerous interesting comparisons between the two vegetational regions could be made. Conclusions, which appear to support observations made in sclerophyll vegetation at the Cape, are: that burning at infrequent intervals may, and often does, extend the chaparral cover; that the heat generated by a fire, activates the seeds of some chaparral species, which apparently lie dormant for long periods under the unburned ground cover; that the root crowns of sprouting brush species are remarkably adjusted to endure severe and frequent burning, so that vigorous sprouting takes place after a fire. An outstanding feature of the succession on burns in the Cape sclerophyll scrub not mentioned by Sampson, and which is therefore apparently not so striking in the chaparral, is the profuse flowering of numerous geophytic plants.

Sampson groups the chaparral species into trees and shrubs (sprouting and non-sprouting); broad-leaved herbs; and grasses. It would, however, have been an improvement had the second group been divided into life-form classes, such as therophytes and geophytes. It would probably also have been more satisfactory for readers not intimately acquainted with the Californian flora, had the Latin names been used in the text instead of the popular ones.

The publication is readable and is recommended to all who are interested in the ecology of sclerophyll vegetation, and more particularly in the effects of fire.

C. L. Wicht.

S. D. Garrett: Root Disease Fungi. 177 pp. Waltham, Mass., the Chronica Botanica Co., 1944. $4·50. Johannesburg, Central News Agency, Ltd.

The fungi which cause root diseases are members of many systemic groups and are alike only in sharing as their common habitat the soil and the roots which occupy it. The volume under review is in no sense a textbook of these fungi, but concerns itself with their way of life and their ecological relations to the soil and its other inhabitants. By

limiting himself mainly to the consideration of a relatively small number of economically important fungi, the author has been able to discuss in detail the varied and complex factors which decide whether root or fungus shall survive.

To the plant pathologist, this new volume from Rothamsted is a valuable progress-report of widely-scattered investigations ranging from 1858 to 1942 ; a bibliography of some 400 titles is appended. To the cultivator of plants, its six concluding chapters offer a review of practical measures of disease-control in crop-plants of the field, plantation and glasshouse. To both, it is a milestone along one of the many highways leading to a fuller understanding of the soil from which humanity draws its main sustenance.

E. S. Moore.

James G. Horsfall : Fungicides and Their Action. Waltham, Mass., the Chronica Botanica Co. $5.00. Johannesburg, Central News Agency, Ltd.

Plant pathologists owe much to the Chronica Botanica Co. First it gave us Bawden's " Plant Viruses and Virus Diseases," then Garrett's " Root Disease Fungi," and now Horsfall's " Fungicides ", all written by masters of their subjects. Dr. Horsfall is a particularly happy choice. He has been intimately connected with, and has taken an active part in, that great advance of knowledge of fungicides which has occurred during the last decade or two. His own contributions run through almost the whole field of fungicides : the action of copper and sulphur compounds, inoculum potentials, field assays, problems of deposition, coverage and weathering, dosage-response relationships, antagonisms, synergism, and phytotoxicity. In his book one expects, and one gets, a standard of discussion which only authority and familiarity with the subject can give. Particularly valuable is the author's ability to select from the mass of facts in the modern literature those which are specially significant and likely to start new lines of progress. One might instance the way he picks out the possibilities of using basic nitrogen compounds as antidotes for the toxins of vascular diseases and root rots. Time may show some of the judgments faulty ; but the book is never dull, and Dr. Horsfall's way of approach will be a stimulus to research in the whole field he covers.

The weak point of the book is the chemistry. Formulae are repeated correctly, but one gets the impression that the author is out of his element

when it comes to the chemical side. One shudders, for example, to see chlorobenzene and dichloramine T in the same context. To pursue the same subject for a further example, dichloramine T is used as an illustration of the notion that chlorination increases the fungicidal properties of organic substances which are fungicidal to begin with, whereas in fact dichloramine T shares its potency with other chloramines, even those derived from inert organic compounds like methylamine being fungicidal and the inorganic chloramines being as potent as, and more widely used than, the organic. One does not wish to harp on this weakness, for despite it the book is very good, and one only does so in the hope that there will be an improvement when the book reaches a second edition, which it richly deserves.

The print is readable and the volume well got up.

J. E. van der Plank.

Joseph C. Gilman: A Manual of the Soil Fungi. Ames, Iowa; The Collegiate Press, 1945. xiv 392 pp. 135 figs. Price $5.

When the first comprehensive treatise on soil fungi by Niethammer appeared (1937), one could not but help feeling disappointed at the incompleteness and inaccuracy of the work. Gilman's book, though less pretentious, certainly marks an advance in the systematic treatment of the soil fungi. The author is well aware of the restrictions of his Manual: he has not attempted to give many original data or descriptions, but wanted to provide "a tool in the hands of investigators that will enable them to identify the soil fungi which they may encounter in the course of their work." This sympathetic and modest attitude of the author makes it well-nigh impossible to criticize the book which, in general, is well produced. It certainly will find its users, not only among soil mycologists, but also among others who have to identify fungi and the considerable use which its predecessor, Gilman and Abbott's Summary (1927), has found, will guarantee a wide distribution of the Manual.

Within the framework of the restrictions indicated by the author, there are a few omissions that must be mentioned. In particular the German and Russian literature has not always been considered fully and important publications like those of Duché and Heim (1931) and of Campbell on the Scottish Mucorales have been ignored. This results in the omission of a few typical soil fungi and in a certain incompleteness in the otherwise very extensive geographical records.

A much more serious criticism can be made about the illustrations. For each genus there is a small line drawing (never exceeding 2 by 2½ inch), usually redrawn from some more or less "classical" (though by no means always good !) illustration. In several cases the illustrations have suffered from redrawing. I cannot always approve of the author's choice and I certainly cannot see why, at the present stage of mycology, hundred-year-old pictures from Corda and Bonorden should be copied again and again, sometimes even in a still more mutilated form than in Lindau's works. In several cases the source is given wrongly or incorrectly. Another serious objection is that the *species* illustrated is never mentioned either in the captions or in the text. This is a dangerous principle as, strictly speaking, it is only possible to depict specimens or at most species and certainly not genera since in many cases the genera of Hyphomycetes represent very heterogeneous assemblies of species which will have to undergo considerable rearrangement in the future. It is therefore impossible to typify a genus in any other way than by a definite species. Moreover, a modern taxonomic treatise, even if it be a compilation, should not refrain from attempting to indicate generic types !

Though accepting fully the limitations of the book as expressed by the author, the question must be raised in how far systematic mycology and soil microbiology in general are served by compilations like this. For several decades systematic mycology has been in the grip of the Fries-Saccardo-Lindau tradition of shackling, artificial classification and compilation, and usually the more critical work of, for example, the French mycological schools (especially Vuillemin) has been overlooked or ignored. The same conservative attitude is adopted by Gilman who (though he mentions Mason's earlier work and Vuillemin's terminology of spore forms) states that "for the purposes of this volume the general term conidium covering all these types seems adequate". I must admit that a consistent application of Mason's newer morphological results throughout the Deuteromycetes would at present be impossible, but much more use should be made of the principles already established. This would, of course, give ample opportunity for wrong interpretations (did not Mason himself frankly admit this ?) but these would surely be a challenge to critical investigations. And this is what is still badly needed in systematic mycology ! I am afraid that compilations like Gilman's Manual leave mycology more or less where it is and, besides, to tyros they offer no more advantage than the popular German publications of twenty or more years ago, though most of the descriptions are more elaborate and certainly better.

W. J. Lütjeharms.

Claude E. ZoBell: Marine Microbiology. Waltham, Mass., Chronica Botanica Co. Price $5.00. Johannesburg, Central News Agency.

By marine microbiology, Dr. ZoBell means the study of marine bacteria, yeasts and moulds. Other small marine creatures (such as plankton) are dealt with only in relation to these. The author has made a number of important contributions to this field of work. The book is chiefly concerned with marine bacteria: their characteristics; rôle in the transformation of organic matter and sulphur compounds and in the nitrogen and phosphorus cycles of the sea: also as food for various animals. Consideration is given to marine microbiology in relation to the technology of sea foods and to such economic problems as deterioration of nets and cork. The last chapter (Chap. XVIII) is entirely devoted to the microbiology of fresh water and waters of greater and lesser salinity than oceanic water, which subjects receive some attention throughout the book.

The bibliography is extensive and consideration of published work is one of the main features of the book which "provides a key to the relevant literature". As this is scattered and frequently inaccessible, Dr. ZoBell has rendered a considerable service. In such a general review gaps in our knowledge, controversial issues and instances of lack of quantitative data inevitably emerge, and this makes the book useful to workers and prospective workers in this field.

The book is well produced and in addition to 12 diagrams contains a sketch of the Scripps Institution and a number of pleasing vignettes (by A. B. Carlin). Reference to previous and subsequent pages where related subjects are considered, makes the book easy to use.

Wm. Edwyn Isaac.

JOURNAL

OF

SOUTH AFRICAN BOTANY

VOL. XII.

PLANTAE NOVAE AFRICANAE.

"Ex Africa semper aliquid novi."—*Pliny.*

SERIES XXVI.

By Professor R. H. Compton, M.A., and Captain (S) T. M. Salter, R.N. (Ret.).

Amphithalea Fourcadei Compton. (Leguminosae-Liparieae.)

Fruticulosus ramosus, dense foliatus, omnino (praeter corollam) dense appresse argenteo-pubescens. *Ramuli* angusti, cicatricibus prominentibus. *Folia* erecta vel expansa, simplicia, integra, elliptica, sessilia, acuta, mesonevro infra prominente, marginibus parum incrassatis. *Flores* singuli, axillares, sessiles, foliis occulti. *Calyx* subaequaliter semilobatus. *Petala* purpurea, longe unguiculata, glabra. *Ovarium* 1—2-ovulatum. *Fructus* dehiscens, semine uno.

Hab. Cape Province. Humansdorp Division: Witte Els Berg, along eastern spur, 3,000 ft., Dec., 1925, *Fourcade* 3208; Kareedouw Pass, 1,700 ft., June, 1927, *Fourcade* 3242; Kareedouw Peak 2,000 ft., 21 Dec., 1933, *Compton* 4556 (*Type*, in Herb. Nat. Bot. Gardens); Witte Els Bosch Peak, S.W. slopes, 16 Nov. 1941, *Esterhuysen* 6766. Uniondale Division: Formosa Peak, Jan. 1940, *Stokoe* 7392: Helpmekaar Peak, 4,000 ft., 28 Jan., 1941, *Compton* 10449, *Esterhuysen* 4597. Knysna Division: Concordia, 700 ft., *Keet* 914. George Division: Montagu Pass, 1,500 ft., 2 Nov., 1894, *Schlechter* 5793.

A small much-branched densely leafy shrub. *Branches, leaves, calyx* and *ovary* covered with a dense appressed silvery pubescence. Branches slender, the leaf-scars prominent. *Leaves* erect to spreading,

entire, elliptical, sessile, acute, the midrib prominent below, 6—9 mm. long, 4—5 mm. wide, flat or somewhat inflexed, the margins slightly thickened. *Flowers* axillary, sessile, solitary, concealed among the leaves. *Calyx* 4 mm. long, sub-equally lobed about half-way down, the ventral lobe slightly the longest, the two dorsal lobes joined a little higher than the others : lobes narrow, attenuate, pubescent inside as well as outside. *Vexillum* light purple, claw 2 mm. long, limb quadrate-orbicular, 4 mm. long and wide, emarginate, with short incurved auricles, the sides somewhat reflexed. *Alae* dark purple, claw slender, 2 mm.

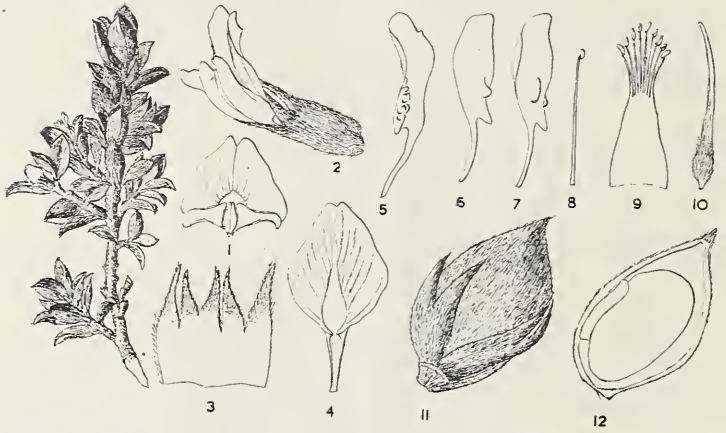


Fig. 1. *Amphithalea Fourcadei*. Portion of plant, nat. size. 1. Flower, front view. 2. Flower, side view. 3. Calyx, laid out, seen from within. 4. Vexillum. 5. Alae, from within. 6. Carina, from outside. 7. Carina, from within. 8. Old stamen. 9. Stamens. 10. Gynaecium. 11. Legume and calyx. 12. Legume, sagittal section. All × 5. (*Compton* 4556.) *Del.* W. F. Barker.

long, limb 3 mm. long. *Carina* dark purple, claws 2 mm. long, limbs 3 mm. long. *Ovary* 1—2-ovulate. *Fruit* 1-seeded, dehiscent, 6 mm. long.

This new Amphithalea has been collected on several occasions and has been variously placed in herbaria as *A. imbricata* (L) Druce (=*A. densa* E. & Z.), *A. violacea* Benth. and *A. phylicoides* E. & Z. It is, however, well distinguished by its growth and leaf characters from all these species, and it occupies a distinct area along the Tsitsikamma Mountains from the Montagu Pass eastwards to the Kareedouw Pass. I am indebted to Dr. H. G. Fourcade for assistance in connexion with this plant, which I name in his honour.

Erica extrusa Compton. (Ericaceae-Ericoideae.) § Hermes.

Fruticulus humilis ramosus. *Ramuli* divaricati, ascendentes, minute puberuli. *Folia* 3-nata, erecta, non appressa, parum incurvata, linearia, sulcata, apiculata, glabra. *Flores* terminales et axillares ad apicem ramulorum. *Pedicelli* angusti, elongati, minute puberuli. *Bracteae*

Fig. 2. *Erica extrusa*. 1. Portion of plant, nat. size. 2. Whorl of leaves × 5. 3. Leaf from below × 5. 4. Leaf, side view × 5. 5. Flower × 10. 6. Corolla × 10. 7. Bracts × 10. 8. Sepal × 10. 9. Anther, back view × 20. 10. Anther, front view × 20. 11. Stamen, side view × 10. 12. Gynaecium × 10. (*Compton* 16817.) *Del.* W. F. Barker.

remotae, anguste lineares. *Sepala* ad corollam firme appressa, rigida, sulcata, apiculata, marginibus minute glandulosis. *Corolla* glabra, rosea, urceolata, quadrangula, angulis inter sepala extrusis, segmentis erectis, ovatis, obtusis, denticulatis, tubo subaequalibus. *Filamenta* tenuia. *Antherae* inclusae, brunneae, late cristatae. *Ovarium* glabrum. *Stylus* angustus, stigmate exserto, capitellato.

Hab. Cape Province. Caledon Division: Palmiet River, Elgin, Dec., 1941, *Stokoe* 7957; Palmiet River Valley, Grabouw, Jan., 1943, *Stokoe* 8577; East foot of Kogelberg, 16 Jan., 1944, *Esterhuysen* 9995; Aries Kraal, 18 Nov., 1944, *Barker* 3354, *Compton* 16508; 30 Dec., 1944, *Compton* 16817 (*Type*, in Herb. Nat. Bot. Gardens).

A small much-branched bushy shrublet, usually less than 20 cm. high. *Branches* divaricate, ascending, minutely puberulous. *Leaves* 3-nate, erect, not appressed to stem, a little longer than the internodes, linear, slightly incurved, 4—8 mm. long, 1·0—1·5 mm. wide, apiculate, sulcate, glabrous. *Flowers* terminal and axillary towards the end of the branches. *Pedicels*, *bracts* and *sepals* red. *Pedicels* 4—6 mm. long, slender, minutely puberulous. *Bracts* narrow-linear, minutely denticulate, scattered $\frac{1}{2}$ to $\frac{3}{4}$ along pedicel, 1·5—2·0 mm. long. *Sepals* narrow, closely appressed to corolla, 2·5 mm. long, rigid, apiculate, sulcate, with minutely glandular margins. *Corolla* urceolate, glabrous, pink, 4 mm. long, 3 mm. diam., quadrangular, the angles expanded at the base into 4 gibbosities between the sepals, the segments erect, broadly ovate, obtuse, minutely toothed, about equalling the tube in length. *Filaments* slender, 2 mm. long. *Anthers* included, smooth, brown, 1 mm. long, with a pair of broad lobed basal crests, the pore $\frac{3}{4}$ the length of the cell. *Ovary* glabrous, broadly ovoid. *Style* 2·5 mm. long, slender. *Stigma* capitellate, exserted.

This small summer-flowering heath grows in local societies on coarse sand or quartzite gravel derived from the Table Mountain Sandstone hills of the Palmiet River valley below Grabouw. The basal almost saccate protrusions of the corolla between the sepals are distinctive and have suggested the specific name, and the glabrous ovary and cristate anthers assist in separating it from other species of the § Hermes (into which, as a matter of fact, it does not fit very well).

Euryops breviloba Compton. (Compositae-Senecioneae.)

Frutex erectus, paullum ramosus, omnino glaber. *Rami* teretes, medullati. *Folia* viridia, erecto-patentia, pinnati-partita, lobis utrinque 4—7, oppositis vel sub-oppositis, divergentibus, inaequalibus, linearibus, supra canaliculatis, apiculatis. *Capitulum* solitarium, pedunculo longo, nudo, erecto, terminale. *Involucrum* labriforme, lobis c. 21, acuminatis. *Receptaculum* planum. *Flosculi radii* c. 21, ligulati; *flosculi disci* numerosi: omnes flavi. *Achaenia* glabra. *Pappi setae* serrulatae, caducae.

Hab. Cape Province. Ceres Division: Karoo Poort, 25 Aug. 1935, *Compton* 5425; 27 Sept., 1944, *Compton* 16069 (*Type*, in Herb. Nat. Bot. Gardens); 27 July, 1941, *Bond* 1191, *Esterhuysen* 5494; *Bolus*

2613 ; cult. at Kirstenbosch, 357/44 : Ceres Wild Flower Show, 30 Sept., 1928, *Hutchinson* 619. Clanwilliam Division : Matjesrivier, Cedarberg, Aug., 1943, *G.E.H. Wagener* 112.

An erect little-branched shrub up to 100—150 cm. high, glabrous throughout, and with little or no surface deposit of resin. *Stems* terete, smooth, slightly decurrent-angled below edges of petiole, with a large pith. *Leaves* green, erecto-patent, 5—10 cm. long, once pinnatipartite, lobes 4—7 on each side, opposite or sub-opposite, spreading, the middle lobes the longest, up to 2 cm. long, usually shorter, rachis and lobes linear, c. 2 cm. wide, furrowed above, apiculate. *Capitula* solitary, terminal on an erect naked peduncle 10—18 cm. long. *Involucre* 12—18 mm. diam., flat-based with erect sides c. 5 mm. deep, bordered by c. 21 erect narrowly triangular lobes which are c. 4—5 mm. long, acuminate with puberulous margins and tips. *Receptacle* flat or slightly concave, honeycombed. *Ray-florets* c. 21, female, ligulate yellow, tube 4 mm. long, limb 30—40 mm. long, 5 mm. wide, oblanceolate, obtuse. *Disc-florets* numerous, hermaphrodite, tubular, yellow, 6 mm. long gradually tapering to base, lobes 1 mm. long. *Achenes* obovate with 5 longitudinal ridges, glabrous. *Pappus* of several white serrulate bristles, 2—3 mm. long, caducous.

A handsome plant, more erect than the well-known *Euryops Athanasiae* Less., and not so tall or straggling, and well distinguished therefrom by the much shorter lateral segments of its leaves. The leaves also distinguish it sharply from *E. Serra* DC. (with which it has been much confused in herbaria) which has narrow serratilobed leaves with many teeth on each side forwardly directed.

De Candolle's description of *E. Serra* reads " glaber, foliis elongatis sessilibus coriaceo-rigidis utrinque lobulis dentibusve grossis acutis distantibus utrinque 10—12 pectinato-serratis . . ." (Prod. VI, 444).

E. breviloba is a conspicuous plant just outside the debouchment of Karoo Poort on the Ceres-Calvinia Karoo, on quartzite rocks at the foot of the Zwartruggens Mountains. It maintains its distinctive characters in cultivation.

E. Serra is a more widely distributed species, though apparently never very abundant : it occurs in localities with a much higher rainfall than *E. breviloba* (e.g. Tulbagh, *Drège ;* Roodesand Pass, Tulbagh side, *Stokoe,* 1 Aug., 1938 ; slopes of Great Winterhoek Mts., near Saron, Nov., 1941, *Stokoe* 8116 ; S. slopes of Mt. Lebanon, Houw Hoek, *Pillans* 2651).

Euryops Wageneri Compton. (Compositae-Senecioneae.)

Frutex erectus, paullum ramosus, omnino glaber. *Folia* erecto-

patentia, pinnatipartita, lobis anguste linearibus, erecto-patentibus, subelongatis. *Capitulum* solitarium, pedunculo erecto, robusto, nudo, terminali. *Involucrum* labriforme, supra parum latiore, lobis c. 21,

Fig. 3. Leaves of Euryops spp., nat. size. A. *E. breviloba* (Compton 16069). B. *E. Wageneri* (Wagener 101). C. *E. Serra* (Pillans 2651). D. *E. Athanasiae*, rather smaller than the average. (*Compton* 9497.) *Del.* W. F. Barker.

attenuatis. *Flosculi radii* c. 21, ligulati, aurantiaci, speciosi : *flosculi disci* numerosi. *Pappi setae* parum plumosae, caducae.

Hab. Cape Province. Clanwilliam Division : Cedarberg, Aug. and Sept. 1943, *G. E. Wagener* 101 (*Type*, in Herb. Nat. Bot. Gardens) : cult. at Kirstenbosch 354/43 : Ezelbank, 4,000 ft., *Schlechter* 8836.

A tall, erect, little-branched shrub, glabrous throughout (except the

tips and margins of the involucral segments). *Leaves* relatively numerous and close-set, erecto-patent, once pinnatipartite, 5—8 cm. long, lobes about 4—6 on each side, opposite or sub-opposite, erecto-patent, 1—3 cm. long, apiculate, rachis and lobes furrowed above, c. 1·5 mm. wide. *Peduncle* terminal, erect, stout, terete or finely striate, nude, up to 25 cm. long and 4 mm. diam. *Capitulum* solitary. *Involucre* flat-based or slightly intruse, up to about 15 mm. diam., broadening above to about 20 mm. diam., with about 21 erect teeth which are 7—8 mm. long with attentuate points which are puberulous tipped and margined. *Ray-florets* c. 21, female, orange-coloured, tube c. 4 mm. long, limb up to c. 42 mm. long, 10 mm. wide, oblong-lanceolate, obtuse, with a minute apiculus. *Disc-florets* numerous, hermaphrodite, tube 6·5 mm. long, lobes 1·5 mm. long. *Pappus* 2·5 mm. long, of straight or slightly flexuous bristles, slightly plumose, caducous.

This conspicuous shrub bears a general resemblance to *E. Athanasiae* Less. from which it differs in the smaller leaves with shorter segments, the relatively longer and stouter peduncles, the deeper involucral cup and longer segments, and the orange colour of the ray-florets which are distinctly wider and give the capitulum a more handsome appearance. I name it in honour of the late Mr. G. E. H. Wagener, J.P., of Cedarberg, an enthusiastic observer of the plants of his district, whose death deprived the Kirstenbosch Herbarium of a valued contributor.

Euryops breviloba and *E. Wageneri* together with *E. Serra* DC. and *E. Athanasiae* Less. form a natural group of species : they are readily distinguished from one another by their leaves, typical examples of which are illustrated in Fig. 3.

Marasmodes undulata Compton. (Compositae-Anthemideae.)

Fruticulus diffusus, ramis divaricatis, rigidis, glabris, sparse glandulosis. *Folia* alterna, erecto-patentia, sessilia, linearia, glabra, glanduloso-punctata, mucrone parum reflexo. *Capitulum* solitarium, terminale, sessile. *Involucrum* obconicum ; *bracteae* numerosae, multiseriatae, *exteriores* foliaceae marginibus apicibusque scariosis, *interiores* anguste obcuneatae, fere totius scariosae, apicibus latioribus, obtusis, undulatis, sub-expansis. *Flosculi* c. 21. *Corolla* infra tubulosa, supra campanulata, parum glandulifera, lobis expansis. *Antherae* basi obtusae, parum exsertae. *Stylus* robustus. *Achaenia* glabra, in humiditate mucosa. *Pappi squamae* paucae, inaequales.

Hab. Cape Province. Paarl Division : gravelly flats north of Huguenot, 26 April, 1946, *Compton* 17987. (*Type*, in Herb. Nat. Bot. Gardens.)

A small diffuse shrub. *Branches* terete, slender, divaricate, rigid, glabrous, with a few scattered superficial glands. *Leaves* alternate,

sessile, erecto-patent when young, spreading when old, linear, slightly auricled at base, glabrous, glandular-punctate, with a short slightly reflexed apiculus, 4—6 mm. long, 1 mm. wide. *Capitula* solitary, terminal, sessile, 7—8 mm. long, 6—7 mm. diam. *Involucre* obconic, the bracts numerous, multiseriate, the outer ones foliose with a narrow

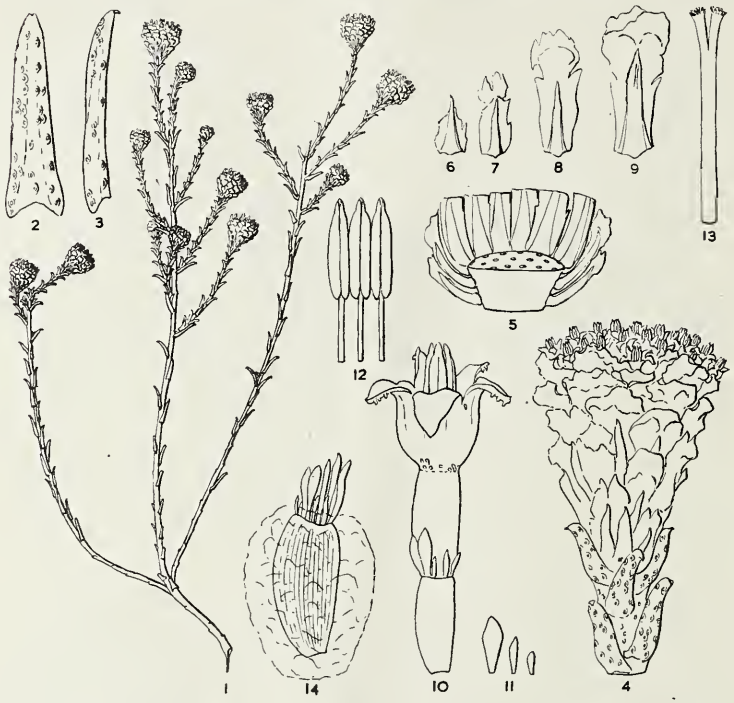


Fig. 4. *Marasmodes undulata.* 1. Portion of plant, nat. size. 2. Leaf from below × 5. 3. Leaf, side view × 5. 4. Capitulum × 5. 5. Part of receptacle and bracts × 5. 6—9. Bracts × 5. 10. Floret × 10. 11. Pappus scales × 10. 12. 3 stamens × 10. 13. Style and stigma × 10. 14. Achene after boiling × 10. (*Compton* 17987.) *Del.* W. F. Barker.

scarious margin and tip, grading to the innermost ones which are about 4 mm. long and 2 mm. wide, almost wholly scarious, narrowly obcuneate with a broader half-spreading obtuse undulate tip. *Receptacle* flat. *Florets* c. 21, glabrous, the tube cylindrical 1·5 mm. long, 0·8 mm. diam., the campanulate portion slightly glandiferous, 1·0 mm. long, the lobes spreading, ovate, yellow, 1·0 mm. long. *Ovary* 1·5 mm.

long, glabrous. *Pappus* of a few (6—10) unequal colourless scales, up to 0·8 mm. long. *Anthers* blunt at the base, shortly exserted. *Style* stout, lobes truncate, bristly at the tip.

An inconspicuous shrublet, distinguished from other species of Marasmodes by its rather larger solitary capitula with the innermost involucral bracts broadly scarious and undulate at their obtuse apices. The achenes have a surface coating of mucilage which swells up when wetted and becomes adhesive.

Relhania latifolia Compton. (Compositae-Inuloideae.)

Frutex erectus, rigidus, aromaticus, omnino glaber. *Rami* teretes, foliis occulti. *Folia* numerosa, coriacea, erecto-patentia, orbiculari-obovata, integra, perobtusa sed apiculata, multipunctata, venis inconspicuis. *Capitula* c. 5—10, in umbella simplice terminali, partim foliis occulta, breve pedunculata, cylindrica, basi obconica. *Involucri bracteae* multiseriatae, erectae, imbricatae, scariosae. *Paleae* angustes, acutae, transparentes. *Flosculi radii* c. 16, breviter ligulati, feminei; *flosculi disci* tubulares, hermaphroditi. *Achaenia* glabra. *Pappi squamae* paucae, parvae, acutae.

Hab. Cape Province. Clanwilliam Division: Het Kruis, 29 Sept., 1943, *Compton* 15016 (*Type*, in Herb. Nat. Bot. Gardens), *Leighton* 85.

An erect, rigid, aromatic shrub, glabrous in all parts. *Branches* arcuate-erect, terete, concealed by overlapping leaves when young, with distinct leaf-scars later. *Leaves* numerous, coriaceous, entire, erecto-patent, green, orbicular-obovate, obtuse but apiculate, the veins inconspicuous, glandular-multipunctate on both surfaces, the margin slightly thickened, very uniform in size on the same branch, c. 6—9 mm. long, 5—7 mm. wide. *Capitula* c. 5—10 in a simple terminal umbel, their peduncles and bases hidden by adjoining leaves. *Peduncles* 3—4 mm. long, erect, slender. *Involucre* cylindrical, obconic at base, 9—10 mm. long: bracts multiseriate, erect, imbricate, scarious, the innermost slightly diverging and more transparent, linear, 7 mm. long, 1 mm. wide. *Paleae* 6 mm. long, narrow, acute, transparent. *Florets* c. 16 ligulate and 36 tubular, yellow: *ray-florets* tubular except at the expanded tip, female, the tube 2·5 mm. long, the limb 2·5 mm. long, 1·0 mm. wide, the ovary 3·5 mm. long; *disc-florets* hermaphrodite, the ovary 3·5 mm. long, the corolla with a basal slender portion 3·0 mm. long, an upper wider portion 1·5 mm. long, and lobes 0·5 mm. long. *Ovaries* glabrous, slender. *Pappus* a cup of a few transparent pointed scales, 0·3 mm. long.

Relhania latifolia is related to *R. squarrosa* L'Hér., a widely distributed and "variable" species, and it might possibly be regarded as a

variety thereof. It is distinguished by its broad flat obtuse erecto-patent (not squarrose) leaves, its slightly larger capitula, and the narrower upper portions of the tubes of the disc-florets and ligulate portions of the ray-florets. Certain Piquetberg gatherings may form a connecting link between it and *R. squarrosa.*

Metalasia langebergensis Salter. (Compositae-Senecioideae) § Eu-metalasia.

Sectioni *Condensatae* accedit, atqui nulli specei singulari prope affinis. *Squamae* involucrales bi-seriatae admodum *M. quinqueflorae* DC., sed spathulatae et apice cuspidatae et roseo-tinctae, non valde acutae albaeque. *Fruticulus* robustior, rigidior. *Folia* congesta, fasciculata. *Capitula* satis numerosa, 5-flora. *Squamae* extimae sub-membranaceae, non foliaceae. *Corolla* longior. *Pappus* apice vix ampliatus, acutus.

A rigid shrublet up to 60 cm. high, the younger branches sparsely lanate, rather densely leafy right up to the inflorescence. *Leaves* sessile, fascicled, narrow-linear, mucronate, spirally twisted in the lower half, glabrous beneath, strongly involute*, the tomentose upper surface almost concealed: subtending leaf in each fascicle up to 7 mm. long, the remainder shorter. *Corymbs* dense, hemispherical, slightly compound, 1·5—2 cm. in diam., with 20—80 congested capitula. *Capitula* cylindrical, very shortly pedicellate, 6—7 mm. long, 1·6—2 mm. in diam., 5-flowered. Outer *involucral scales* spirally arranged in several ranks, woolly-matted in the lower part, acuminate, subspinous, reddish brown and at length spreading at the apex, the outermost very small, subulate, gradually lengthening and broadening inwards, their shape almost merging into the shape of the inner scales: inner scales free, sub-biseriate, spathulate, cuspidate, white, more or less rose-tipped, about 1·2 mm. wide towards the apex. *Pappus* bristles white, acute, serrulate, scarcely thickened at the tip. *Corolla* narrow-tubular, red in the upper half, 3 mm. long, the lobes narrowly ovate-deltoid.

Hab. Cape Province: Riversdale Div.; summit of Garcia's Pass, *Salter* 6771 (*type* in Bolus Herb.). Flowering July. *Co-type* has been sent to Kew.

This species belongs to the sub-section Condensatae, but has no very near affinity. The inner involucral scales are bi-seriate as in *M. quinqueflora* DC., but spathulate, cuspidate and pink-tinged towards the apex, not sharply acute. It is a much more robust and rigid shrublet with closely fascicled leaves and with many more capitula in each head.

* In this and the following species of Metalasia the leaves, owing to the twisting at the base, have the appearance of being *revolute* with the tomentose surface facing the ground, whereas morphologically they are *involute*, the tomentum being really on their upper surface.

The outermost involucral scales are sub-membranous, not foliaceous, the corolla longer and the pappus bristles acute and scarcely thickened at the apex.

Metalasia rhoderiodes Salter (Compositae-Senecioideae) § Eu-metalasia. *M. divergenti* Don proxime accedit, sed ita differt :—*Ramuli* apicem versus plerumque roseo-tomentosi. *Capitula* numerosiora, lana rosea lenta inter se dense constricta. *Squamae* exteriores uniseriatae, in lana, nisi tamen ad apicem, dense circumstrictae : interiores 5—6, sub-uniseriatae, albae vel raro pallide roseo-tinctae, interdum squamis 1—2 parvis in intervallo additis.

A diffuse shrublet up to 40 cm. high, with densely woolly-tomentose branches, usually pink towards the tips of the branchlets. *Leaves* fascicled, lanceolate, linear-lanceolate or oblong, pungent-mucronate or sub-apiculate, usually more or less involute and spirally twisted, white-tomentose above, cobwebby beneath, the subtending leaf in each fascicle commonly 0·5—1 cm. long, the axillary much smaller and rarely glabrescent above. *Inflorescences* terminal, solitary or in shortly pedunculate pairs. *Floral bracts* linear-lanceolate or spathulate, acuminate, mucronate, lanate, the tips only free. *Capita* very compact, hemispherical, 1—1·5 cm. in diam. *Capitula* usually numerous, sessile, cuneate in outline, 4—4·5 mm. long, 5- or more rarely 3—4-flowered, bound together in the lower half with tough pink cottony wool. Outer *involucral scales* linear, acute, 1-seriate, deeply embedded in the wool, the subulate tips only free : intermediate scales 1—2, free, small, white, scarious, or wanting : inner scales usually 5—6, sub-uniseriate, linear, white or rarely tinged with pink, acute, about 0·7 mm. broad. *Pappus* bristles serrulate, white, very slightly thickened towards the acute apex. *Corolla* 3—3·5 mm. long, the tube tapering slightly to the base, 0·6—0·7 mm. broad at the apex, deep orange-red in the upper half: ; lobes narrowly ovate-deltoid, very short.

Hab. Cape Province : Paarl Div. ; stream-side, Witte River Valley, *Esterhuysen* 8681 (*type* in Bolus Herb.) ; shale band between Bailey's Peak and Pic Blanc, 3,500 ft., *Esterhuysen* 8524, *Stokoe* 8161 ; moist cliffs on S.E. slopes of Limietberg, 3,000 ft., *Esterhuysen* 1601 ; Wellington Sneeuwkop, 4,000—5,000 ft., *Esterhuysen* 13000 : Worcester Div. ; Slangkop Mts., Cossacks, *Esterhuysen* 8620 : Caledon Div. ; East side of Kogelberg, 2,000 ft., *Leighton* 877, *Compton* 16859, 16864 ; Palmiet River Valley, *Stokoe* 8730. Flowers Dec.—Apl.

This very distinct mountain species may be at once recognised by the pink cottony wool which binds the capitula together, the tomentum on the upper part of the branchlets being also frequently, though not in-

variably, pink. It is perhaps most nearly related to *M. divergens* Don, but differs in its far more numerous capitula and the uniseriate outer involucral scales, which are closely embedded, except at the extreme tip, in the pink wool of the flowering head, and so break away from the capitulum on dissection.

Metalasia riparia Salter (Compositae-Senecioideae) § Eu-metalasia. *M. muricatae* Less. affinis sed ita differt :—*Capitula* valde breviora, in dimidio inferiore lana pallide aureo-viridi dense constricta. *Subcapita* densissima, multiflora, glomerulis plerumque 4—10 itidem lanato-constrictis. *Corolla* valde brevior, inferne ampliata. *Squamae* involucrales exteriores scariosae, glabrae, liberae, 2-seriatae : interiores 1-seriatae, minus acutae.

A large robust erect shrub 1·5—2·5 m. high. *Branches* ascending, the younger woolly-tomentose, rather densely leafy almost to the apex, straightish, usually with few branchlets. *Leaves* fascicled, spirally twisted, involute, lanate beneath, white-tomentose above, mucronate : subtending leaf in each fascicle up to 1 cm. long, the remainder much smaller. *Flowers* white. *Inflorescence* corymbose, often 3—5 cm. in diam., usually with 10—15 pseudo-umbellate tomentose branches about 1·5—2 cm. long, each bearing one leaf-like bract, usually near the apex. *Subcapita* 10—15, 1—1·5 cm. in diam., compound, densely woolly-matted : glomerules 4—10, rarely less, shortly pedicellate, with an outer involucre of sub-foliaceous mucronate bracts matted together below. *Capitula* about 10 in each glomerule, subsessile, 3-flowered, about 4 mm. long, the outer involucral scales 2-ranked, narrow-linear or subulate, scarious, sharply acute, white or pale straw-coloured, the inner 1-ranked, longer, linear, obtuse or subacute, white, 0·5—0·6 mm. broad, shortly overtopping the corolla. *Pappus* bristles white, serrulate, broadening and oblanceolate at the tip. *Corolla* tubular, yellow, about 2·7 mm. long, slightly swollen in the lower half, the lobes erect, deltoid, 0·3 mm. long. *Achene* (mature) oval, black, 1·5 mm. long, minutely papillose.

Hab. Cape Province : Caledon Div. ; streamside near Palmiet River mouth, *Salter* 5179 (*type* in Bolus Herb.) *Levyns* 5333 ; Platteberg and Paardeberg, near Palmiet River mouth, *Stokoe* 9075 : streamside, Onrust River Mt., *Esterhuysen* 4922. Flowers Nov.—Feb. *Co-types* were distributed to the British Museum and Kew.

Rather local and growing in dense thickets on stream sides. Its nearest affinity seems to be *M. muricata* Less., but it differs from all the many forms of that species as follows :—*Capitula* much shorter, closely bound together with pale greenish yellow wool in the lower half. *Subcapita* very dense, many flowered, the individual glomerules also bound

together with wool. *Corolla* much shorter, somewhat swollen in the lower half. Outer *involucral scales* scarious, glabrous, free, in 2 ranks: inner scales in 1 rank, less acute.

Metalasia xanthocephala Salter (Compositae-Senecioideae) § Eumetalasia.

M. aureae Don affinis sed ita differt:—*Corymbus* minor simpliciter subumbellatus, eramosus, apice planior. *Flores* saturatius flavi. *Capitula* latiora, basin versus minus attenuata, densius lanato-stricta. *Involucri* squamae exteriores apicem versus non carinatae, interiores non mucronulata. *Pappus* praecipue apicem versus minute plumosus. *Corolla* longior, in tubi faucibus non ampliata.

A rigid, widely branching shrub, 60—90 cm. high, the younger branches and branchlets thinly lanate. *Leaves* fascicled, linear, spirally twisted, sharply acute, subspinous, sparsely woolly or almost glabrous beneath, strongly involute, the white-woolly upper surface almost concealed: subtending leaf in each fascicle usually 0·6—1 cm. long, sometimes reflexed, much longer than the remainder. *Capitula* cylindrical, 7—8 mm. long, 1·5—2 mm. in diam., 5-flowered, shortly pedunculate, usually 8—24 in close terminal simple corymbs 0·8—1·3 cm. in diam.: peduncles shortly white-woolly, 1—3 mm. long. Outer *involucral scales* in several series, spirally imbricate, closely matted together with white tough cottony wool below, the outermost minute, progressively lengthening inwards, linear, smooth, acute, mucronate, pale yellowish brown, the 5 innermost scales equal, free, scarious narrowly linear-cuneate, obtuse or subtruncate at the apex, yellow-tipped, as long as the corolla, about 1·3 mm. broad at the apex. *Pappus* bristles slightly longer than the corolla, minutely plumose, particularly towards the apex, with a slightly widened yellow limb. *Corolla* about 4 mm. long, yellow, the tube tapering a little to the base: lobes ovate-deltoid, about 0·5 mm. long. *Achene* oval, 1·2 mm. long, minutely scabrid.

Hab. Cape Province: Malmesbury Div.; Oude Post, between Malmesbury and Hopefield, *Salter* 4407 (*type* in Herb. Bolus); Kalabas Kraal, *Salter* 7179; Cape Div.; flats 2 miles N.E. of Durbanville, *Pillans* 8529; Paarl Div.: between Mulder's Vlei and Phesante Kraal, *Salter* 4393; low clay ridges 1½ miles S.W. of Joostenberg (Hercules Pillar), *Pillans* 7618; flats north of Paarl, *Compton* 18121; Tulbagh Div.; near Wolseley, *Salter* 7301. Flowers April—June. *Co-types* were distributed to the South African Museum, Cape Town, the British Museum and Kew.

An affinity of *M. aurea* Don, but differing in its smaller simple flat-topped unbranched corymb, deeper yellow flowers, rather broader

capitula, less attenuate below and more densely woolly-matted, the outer involucral scales not keeled on the upper part and the inner scales not mucronulate, the minutely plumose, rather than serrulate pappus bristles and the corolla is longer and not appreciably widened at the throat of the tube.

The description of *M. aurea* in the Flora Capensis, Vol. III, p. 270, was compiled from dried specimens. The flowers are actually lemon-yellow and the corolla is about 3 mm. long with the tube distinctly widened at the throat. Harvey states that "the heads (capitula) are rather few or very numerous," but they are, in fact, almost invariably very numerous. It seems *possible* that Drége's small specimen in Herb.

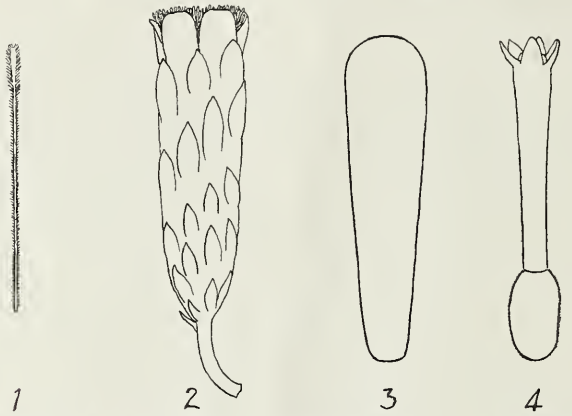


Fig. 5. *Metalasia xanthocephala*. 1. Pappus bristle × 10. 2. Capitulum × 6. 3. One of the five free involucral scales × 9. 4. Corolla and achene × 9. (*Salter* 4407.) *Del.* T. M. Salter.

Sond. from Berg River, marked *M. octoflora* DC., which Harvey says "in no respect differs from *M. aurea*" was, as its locality suggests, actually *M. xanthocephala* in which the heads are comparatively few-flowered. Harvey, having never seen the two species in the living state, may well have thought them the same and it is also significant that *M. aurea* is a species with a more easterly distribution.

It is, at any rate, inconceivable that De Candolle's description of *M. octoflora*—branches adpressedly pubescent, capitula ovate-cylindrical, 8-flowered—could possibly have been applied to the species described here. If he had ever dissected the capitulum of this plant he must surely have noticed that the pappus bristles were minutely plumose and not serrulate.

SOME NOTES ON THE GENUS HERMANNIA, WITH DESCRIPTIONS OF FIVE NEW SPECIES.

By Captain (S) T. M. Salter, R.N. (Ret.).

The large genus Hermannia, in which it is now generally considered that Mahernia should be embodied, is, at least as far as the South African species are concerned, greatly in need of revision, but the task is one which is not to be undertaken lightly.

In the preparation of the present paper, in which I have proposed five new species, all of which (except *H. confusa*) I have observed in the field, it has involved the scrutiny of a large number of scattered descriptions of species published since the rather doubtful account in Flora Capensis, Vol. I, now over eighty years old. I have been struck particularly by the difficulties involved owing to the brevity of most of the descriptions and by the great importance in this genus of field notes such as the size, habit, habitat, colour of the flowers, etc., details which have been but rarely recorded with the specimens collected. The colour of many of the flowers soon changes or is lost in drying. As an instance of this, reference may be made to my notes, under *H. scabricaulis*, as regards the colour of the flowers in *H. lacera* (E. Mey. ex Harv.) Fourcade (*Mahernia scabra* E. & Z.). Dr. Fourcade, who knows *H. lacera* in the living state, has kindly given me the true colour " yellow with a purple base, drying reddish " as opposed to the guesses of Ecklon and Zeyher " violaceous " and Harvey " reddish ". I have also alluded to Harvey's citation of *Drège* 7307a here. This is *Mahernia pilosula* Harv., a species with reddish orange flowers, but it is possible that there has been some accidental interchange in the numbers *Drège* 7307 and 7307a. The difference in the colour of the flowers was of great importance to me in suggesting that more than one species had been cited under one name, apart from other less apparent structural differences.

The revelations which have come to light in the case of *Mahernia scabra* are for the most part the result of some knowledge of the plants in the living state. It may be only a coincidence, but it seems open to question whether some of the other species would bear critical examination. It is but rarely, however, that so many of the old cited specimens are represented in South Africa. Nearly all those which I have been able to examine are in a terrible state of preservation,

Again, to illustrate the importance of habitat notes, *H. ternifolia* Presl., in which the leaves are normally cuneate, truncate or emarginate, has been observed sprouting from the roots on recently burnt ground with such abnormal leaves that its identity could only be determined with difficulty, a somewhat disconcerting fact in a genus in which the classification is at present greatly dependent on the leaves.

Many of the species, especially in the § Mahernia, are prostrate or decumbent in habit, but it is not always easy to detect this from dried specimens.

It is therefore to be hoped that collectors will supply fuller particulars of this nature with their specimens while the facts are fresh in their memories.

More detailed descriptions are also necessary. Whereas a species may be distinguished from what is supposed to be its nearest affinity, it must be remembered that there are others still to come which may differ in some character not even mentioned in the existing description.

Even in the Bolus Herbarium alone, there are very large numbers of unidentified species and, with the improved facilities of modern transport, more and more are being added from year to year.

Hermannia scabricaulis Salter sp. nov. (Sterculiaceae-Mahernia) § Lacerifoliae.

H. lacerae (E. Mey. ex Harv.) Fourcade (*typus* E. & Z. 398) affinis sed ita differt:—Partes herbaceae, nisi tamen rarissime folia, omnino sine pilis stellatis. *Stipulae* connatae. *Folia* incondite crenato-dentata, vix lacerata et non pinnatifida. *Calyx* brevior, 5—6 mm. longus lobis attenuatis. *Stamina* breviora 5—6·5 mm. longa: filamentorum lobi e basi remotiores.

A procumbent woody shrublet, densely clothed with glandular-capitate hairs. *Stipules* free 4—6 mm. long, 3—4 mm. broad, obovate, acute variously toothed. *Leaves* petiolate, the blades elliptical, oval, ovate or obovate, mostly 2—4 cm. long, 1·5—2·5 cm. broad, irregularly crenate-dentate, scarcely lacerate, usually glabrous above, minutely glandular-pilose beneath and on the margins, very rarely with a few scattered stellate hairs: petioles 0·5—1 cm. long. *Flowers* dull pink. *Peduncles* twice or more longer than the leaves, like the pedicels and bracts glandular-pilose. *Bract* not or scarcely sheathing, 4—5 mm. long, about 4 mm. broad, irregularly toothed. *Calyx* widely campanulate, 5—6 mm. long, glandular-pilose, the teeth ovate-lanceolate, attenuate, acute, rather longer than the tube. *Petals* about 1 cm. long, the obovate limb 4 mm. long, rather longer than the pubescent claw. *Stamens* 5—6·5 mm. long: filaments cruciform, about 1·2 mm. broad across

the lobes : lobes 3 mm. from the base, stellate-pilose : anthers 3—4 mm. long. *Ovary* oval, densely pilose with glandular and stellate hairs : style sparsely pubescent on the lower half. *Capsule* oval, sharply ridged, about 1·3 cm. long.

Hab. Cape Province : Cape Div. ; Blaauwberg, *Zeyher* 130 (*type* in Bolus Herbarium) ; Kuils River, *Zeyher ;* Tygerberg *Pillans* 4762 : Cape Peninsula ; near Muizenberg, *Bolus* 4942, *Wolley-Dod* 3686, *Marloth* 573 ; near Retreat, *Pillans* 4008 ; Maitland, *Guthrie* 603 ; Clovelly, *Michell ;* Chapmans Bay, *Adamson* 2259 ; west of Vasco da Gama Peak, *Salter* 6218 : Caledon Div. ; Houw Hoek, *Guthrie* 4688 : Riversdale Div. ; Eland's Kop, *Muir* 1776.

An affinity of *H. lacera* (E. Mey. ex Harv.) Fourcade (*Mahernia scabra* E. & Z. of the Flora Capensis Vol. I, p. 214, excluding *Zeyher*, Blaauwberg, a different species which is here taken as the *type* of *H. scabricaulis,* and also *Drège* 7307a). *H. scabricaulis* differs from *H. lacera* as follows :—Herbaceous parts, except very rarely the leaves, entirely without stellate hairs. *Stipules* free. *Leaves* much less deeply divided, the petioles shorter, up to 1 cm. long. *Calyx* shorter, 5—6 mm. long, the teeth attenuate. *Stamens* shorter, 5—6·5 mm. long : lobes of the filaments more distant from the base.

Harvey has confused at least two, or perhaps three distinct species under *Mahernia scabra* E. & Z. in Flora Capensis. His description appears to apply in part to Zeyher's Blaauwberg specimen which is not the same as *E. & Z.* 398, his *type*, but probably *Drège*, from Zondag's River (*M. lacera* E. Mey.) should be considered as the *type* under the new combination *H. lacera* Fourcade. *Drège* 7307a, from Paarl district, as represented in the National Herb. Pretoria (ex Herb. Mus. Paris) with a ticket number in Drège's hand-writing, is identical with the *type* of *Mahernia pilosula* Harv., but Harvey cites *Drège* 7307, not 7307a under that species. Possibly the numbers have been wrongly affixed on some Herbarium sheets. *M. pilosula* is a species with reddish-orange flowers. There seems to be a discrepancy in Harvey's description, for neither in the *type* (*E. & Z.* 407) nor in *Drège* or *Pappe*, nor in the many specimens of later collecting, are the bracts " connate into an incised hood ", being, rather, 3-partite almost to the extreme base with the medial lobe forked and the two lateral narrow-linear.

E. & Z. 398 as originally described in Enum. Plant I (1835) is said to have " violaceous " flowers. I am indebted to Dr. H. G. Fourcade for the information that the flowers of his specimens (F. 4675) were " yellow with a purple base ", but they become reddish in drying, the state in which they were seen by Harvey.

Hermannia dichroma Salter sp. nov. (Sterculiaceae-Mahernia). § Verticillatae.

H. humifusae E. & Z. affinis sed ita differt :—*Folia* elongatiora, incondite crenato-lobulata, minus lacerata. *Pedunculi* breviores. *Bracteae* valde minores, fere 4·5 mm. longae, basi vaginantes. *Petala* lacticoloria vel rarius obscure rosea : lamina latior, fere orbicularis, quam unguiculus 2·5-plo longior. *Filamenta* ad lobos 1·2 mm. lata, lobis basi propinquioribus. *Ovarium* latiore, subglobosum.

A widely diffuse or decumbent shrublet, the stems up to 40 cm. long, densely and shortly glandular-scabrid : flowering branchlets with a few admixed stellate hairs. *Leaves* oblong or oblong-elliptical, rarely obovate, obtuse, irregularly crenate-lobulate, scarcely lacerate, mostly 2—5 cm. long, 0·5—1·8 cm. broad, with rather sparse stellate hairs on both faces : petioles glandular-scabrid, 2—8 mm. long. *Stipules* free, lanceolate or ovate-lanceolate, entire, 3—7 mm. long. *Flowers* rather numerous, pale cream-coloured or more rarely dull pink, very sweet-scented. *Peduncles* 2-flowered, as long as or longer than the leaves, like the pedicels glandular-pubescent with admixed stellate hairs : bracts connate in a laxly sheathing involucre about 4·5 mm. long, with 2 short ovate-deltoid teeth at the apex. *Calyx* widely campanulate, 5—5·5 mm. long, stellate-pilose, the teeth ovate-deltoid, attenuate, ciliate, about 2·5 mm. long. *Corolla* campanulate : petals 8—9 mm. long, the limb almost orbicular, stellate-pilose near the base inside, $2\frac{1}{2}$ times as long as the concave claw. *Stamens* 6 mm. long : filaments cruciform 2 mm. above the base, 1·2 mm. broad across the lobes : lobes greenish, densely stellate-pilose. *Ovary* subglobose, about 2·5 mm. long, densely and minutely stellate-pilose : style 4·5—5 mm. long, pubescent near the base.

Hab. Cape Province : Clanwilliam Div. ; 5 miles west of Clanwilliam, *Salter* 2745 (*type* in Bolus Herbarium) ; Graafwater, *Compton* 4300 (dull pink) ; Nardouw Pass, *Salter* 3620, 7534. Flowers September. *Cotypes* were sent to the British Museum and to Kew where it could not be identified.

An affinity of *H. humifusa* E. & Z., but differing as follows :—*Leaves* more elongate and less lacerate. *Peduncles* shorter. *Bracts* very much smaller, sheathing. *Petals* cream-coloured or more rarely dull pink, the limb much longer than the claw. *Filaments* narrower across the lobes, the lobes nearer the base. *Ovary* more globose. It differs from *H. chloroleuca* Diels (ex desc.) in the colour of the flowers, *not* white suffused with green, in the much smaller floral parts and in the calyx, which bears stellate hairs. It is superficially like *H. collina* Schltr., but the upper part of the filaments (above the lobes) is not sigmoid as in that species.

Hermannia oligantha Salter sp. nov. (Sterculiaceae-Eu-Hermannia) § Cuneifoliae.

H. alnifoliae L. affinis sed ita differt :—Partes herbaceae juniores pilis stellatis densis minutis et pilis stellatis laxis majoribus et pilis capitatis adjectis. *Folia* late ovata vel obovata vel fere orbicularia, nequaquam basi cuneata. *Flores* majores : racemi eramosi pauciflori. *Calyx* 5—6 mm. longus : lobi apicibus longioribus subulatis instructi. *Petala* fere 8 mm. longa, laminis 3 mm. latis. *Stamina* 4·5 mm. longa : filamenta apicem versus 1·5 mm. lata ; antherae 2 mm. longae. *Ovarium* sicut stilus longius.

A small much-branched diffuse woody shrublet about 30 cm. high. *Branches* glandular-scabrid, the younger herbaceous parts densely pilose with very minute stellate hairs, glandular-capitate hairs and with some large weak white tubercular-based stellate hairs admixed. *Stipules* usually attenuate from an oblique gibbous base, acute, sometimes falcate, 2·5—6 mm. long. *Leaves* subsessile or shortly petiolate, broadly ovate, obovate or nearly orbicular, 4—9 mm. long, 3·5—7 mm. broad, grey, deeply wrinkled, pilose with the three kinds of hairs, but the glandular-capitate few and inconspicuous : petioles up to 3 mm. long. *Flowers* few, yellow-orange, 1—2, rarely more, in simple unbranched terminal racemes. *Bracts* trifoliolate, the medial lobe linear, the two lateral like the stipules but smaller. *Peduncles* 2—3 mm. long. *Calyx* submembranous, 5—6 mm. long, the teeth deltoid at the base, narrowly attenuate to a subulate apex, rather shorter than the tube. *Corolla* urn-shaped : petals about 8 mm. long, the limb obovate, as long as the claw. *Stamens* 4·5 mm. long : filaments cuneate, 1·5 mm. broad at the apex, broadly membranous at the margins : anthers 2 mm. long. *Ovary* 2 mm. long, densely hairy : style 3 mm. long, puberulous on the lower half. *Capsule* subglobular, about 5 mm. in diam., with three obtuse apical horns.

Hab. Cape Province : Clanwilliam Division ; 5 miles east of Graafwater, *Salter* 2750 (*type* in Bolus Herbarium) ; top of Nardouw Pass, *Pillans* 7093 ; Bull Hoek, *Schlechter* 8384 (a fragment) : Namaqualand ; Kamieskroon, *Compton* 11106 : also identified at Kew as being the same as *Pearson* 6275. Flowers July—Sept. *Co-types* were sent to the British Museum and Kew.

An affinity of the profuse flowering *H. alnifolia* L., but differing in having gland-tipped hairs in addition to the two kinds of stellate hairs, simple few-flowered racemes, the flowers considerably larger, and longer subulate tips on the calyx-teeth.

Hermannia confusa Salter sp. nov. (Sterculaceae-Eu-Hermannia) § Pinnatifidae.

Fruticulus erectus, 20—40 cm. altus. *Caulis* rigidus, inferne lignosus. *Rami* graciles, plus minusve stellato-pilosi pilis glandulosis minutis admixtis. *Stipulae* liberae, oblique ovatae vel lanceolatae, valde attenuatae, auricula gibbosa obtusa induta. *Folia* petiolata, pinnatisecta vel bi-pinnatisecta, supra glabra, infra stellato-pilosa : segmenta ultima anguste linearia, apice saepe seta sola, plerumque setis paucis apicem versus induta : petioli ad 1 cm. longi. *Inflorescentiae* longae, graciles. *Pedunculi* satis remoti, plerumque 2-flori, 1—3 cm. longi. *Bracteae* minutae, tripartitae. *Calyx* 5—6 mm. longus : lobi 2—2·5 mm. longi et lati, e basi deltoidea valde attenuati, ad apicem cuspidati, sinibus rotundatis. *Corolla* flava, fere 9 mm. longa : petalorum laminae late ovales vel ovatae, auricula gibbosa obtusa marginis exterioris basi instructae : ungues apicem versus ciliati. *Filamenta* cuneata, 1·6—2 mm. lata, apice sparse minuteque stellato-pilosa : antherae in ambitu lanceolatae. *Ovarium* obovatum. ad angulos et apicem versus dense stellato-pilosum.

An erect shrublet, 20—40 cm. high, the stem woody below. *Branches* slender, more or less stellato-pilose with minute gland-tipped hairs admixed. *Stipules* free, obliquely ovate to lanceolate, 3—5 mm. long, strongly attenuate, the gibbose auricle obtuse. *Leaves* petiolate, pinnatisect or bi-pinnatisect, mostly 1—3 cm. long, glabrous above, minutely glandular-pilose, stellato-pilose beneath, the ultimate segments narrow-linear, 0·5—1 mm. broad, somewhat decurrent, acute or obtuse, often with one terminal bristle, sometimes with a few more simple bristles near the apex : petioles up to 1 cm. long. *Inflorescences* long, slender, usually minutely glandular, with or without stellate hairs. *Peduncles* rather distant, mostly 2-flowered, 1—3 cm. long, shorter than the internodes. *Bracts* very small, tripartite. *Calyx* widely campanulate, 5—6 mm. long, the tube glabrous or rarely sparsely stellato-pilose : lobes 2—2·5 mm. long and broad, strongly attenuate from a deltoid base to an acute cuspidate, rarely stellato-ciliate apex, the sinus rounded. *Corolla* yellow, urceolate : petals imbricate, about 9 mm. long, the limb broadly oval or ovate, slightly shorter than the claw, with a distinct gibbous auricle at the base of the outer margin : claw arcuate, convex, ciliate on the upper part. *Filaments* cuneate, 4 mm. long, 1·6—2 mm. broad, with membranous wings and with a few small stellate hairs at the truncate apex : anthers lanceolate in outline, 3 mm. long. *Ovary* obovate, densely stellato-pilose on the ridges and towards the apex : style pubescent on the lower half. *Capsule* sub-globose, indented at the apex, about 5 mm. in diam., the stellate hairs on the ridges towards the apex largest.

Hab. Cape Province : Caledon Div. ; between Caledon and Babylon's Tower, *E. & Z.* 374 (in Bolus Herb.) ; Hartebeeste River, *Zeyher* 2001 ;

hills near Caledon and Somerset, *E. & Z.;* Zwartberg, *Schlechter* 5557, *Guthrie* (Bolus Herb. 17034); Houw Hoek, *Guthrie* 3377, *Bolus;* between Caledon and Napier, *Esterhuysen* 3044: Swellendam Div.; Bushmans River, *Compton* 11909: Bredasdorp Div.; Napier, *Compton* 8978: Stellenbosch Div.; near Somerset, Hottentots Holland, *E. & Z.* 408 (*Mahernia pinnata* E. & Z.); Sir Lowry Pass, *Wasserfall* 383: Worcester Div.; Hex River, *Drège*; near De Doorns, *Bolus* 13076; near Worcester, *Leipoldt* 3509, (Bolus Herb. 18622): Ceres Div.; Prince Alfred's Hamlet, *Compton* 11969; Gydouw Pass, *Leipoldt* 3508, *Bolus:* Tulbagh Div.; near Waterfall, *E. & Z.* 377 (*H. coronopifolia* E. & Z.), *Hutchinson* 371; Tulbagh Road, *Schlechter* 8995; near Tulbagh Kloof, *Bolus;* Winterhoeksberg, *Bolus* 5127; Artois, *Esterhuysen* 6083: Malmesbury Div.; near Moorreesburg, *Bolus* 9951: Piquetberg Div.; Piquetberg, *Bolus* 13524; Grooenvlei, *Guthrie* 2551; Piquenier's Kloof, *Schlechter* 4940; Kapitein's Kloof, *Pillans* 8027.

This species comprises the specimens cited by Harvey in Flora Capensis Vol. I, p. 203 under *Hermannia tenuifolia* Sims in Bot. Mag. t. 1348, *viz. E. & Z.* 374, *E. & Z.* 377 (*H. coronopifolia* E. & Z.), *E. & Z.* 408 (*Mahernia pinnata* E. & Z.), *E. & Z.* hills near Caledon and Somerset, *Zeyher* 2001 and *Drège*, Hex River, together with a large number of conspecific specimens of later collecting. I have not seen *Drège*, between Breede River and Bokkeveld, but in all probability it is also conspecific.

My reasons for removing these specimens from *H. tenuifolia* are as follows:—

Although the figure (Bot. Mag. t. 1348) with its 3-word description—*foliis pinnatifido-liniaribus*—has been considered as validly published, it seems advisable to treat it as an imperfectly known species, for the figure might just as well be intended to represent *H. pinnatisecta* Salter sp. nov. (a species unknown to Harvey) which follows here and has similar leaves. It is in reality no more than a "pretty" picture and it is impossible to determine the shape of the petals and, indeed, whether the margins are intended to be sinuate or merely undulate: the calyx is quite characterless and, of course, the sexual parts of the flower are hidden. I do not think the exact identity of Sims' species can ever be known with certainty. I have not seen the defective specimen in Herb. Banks which Sims states to be "like it".

But a further difficulty arises. Owing to the inadequacy of the original description, Harvey must have obtained the details given in the Flora Capensis elsewhere, and it would be assumed from one or more of the specimens which he cites. The five referred to above are certainly conspecific *inter se*, but it has been found that his description differs

in many important respects from my own observation of *E. & Z.* 374 and other undoubtedly conspecific specimens. The stipules are remarkably gibbous at the base and strongly attenuate, not amplexicaul ; the leaves are petiolate, not subsessile ; the bracts are tripartite and there is no sign of a terminal bristle on the calyx lobes, though a few specimens have one or two stellate hairs ; the limb of the petal, described as ovate, is, in fact, asymmetrical having a basal auricle, nor is the claw downy ; the filaments are almost too narrow to be described as obovate, certainly not broadly obovate and the anthers are lanceolate in outline, not hastate. The character of the stiff hair at the apex of the leaf segments appears to be of little value, for these hairs seem to be caducous, some specimens, notably *Zeyher* 2001, being entirely without them, while in others there are several simple hairs close to the apex.

I am unable to explain these discrepancies and have therefore given a full description of this species as *H. confusa*, for there appears to be no point in attaching my description to a species of such uncertain identity as *H. tenuifolia*.

Hermannia pinnatisecta Salter sp. nov. (Sterculaceae-Eu-Hermannia) § Pinnatifidae.

Fruticulus decumbens. *Caules* numerosi, non rigidi, saepe eramulosi, inferne glabrescentes, superne minute stellato-pilosi. *Stipulae* ovatae, attenuate acutae, 2—4 mm. longae. *Folia* glabrescentia, juniora pilis paucis stellatis induta, superiora remota, petiolo incluso 1·5—3 cm. longa, 0·6—2 cm. lata, profunde pinnatisecta vel bi-pinnatisecta : segmenta ultima linearia, basin versus coarctata, decurrentia. *Flores* pauci, flavi, racemosi. *Bracteae* 2—3-partitae, amplectentes, 1—2 mm. longae. *Pedunculi* internodis valde breviores, stellato-pilosi. *Calyx* 7 mm. longus, glanduloso-punctatus, laxe stellato-pilosus, lobis deltoideis leviter acuminatis, sinibus subangulosis. *Corolla* urceolata, 1 cm. longa : petalorum laminae obovatae, raro obscure auriculatae, 4—5 mm. latae. *Filamenta* cuneata, 1·8 mm. lata : antherae in ambitu lanceolatae, acutae, 3 mm. longae. *Ovarium* ovale, saltem ad angulos stellato-pilosum.

A low decumbent shrublet. *Stems* numerous, usually simple, scarcely woody, 20—50 cm. long, usually branching from the root or below ground, glabrescent towards the base, minutely stellato-pilose above. *Stipules* ovate, attenuately acute, 2—4 mm. long. *Leaves* glabrescent, the younger with a few small stellate hairs, solitary, the upper widely distant, including the petiole usually 1·5—3 cm. long, 0·6—2 cm. broad, deeply pinnatisect or bi-pinnatisect, the ultimate lobes linear, obtuse or subacute, tapering towards the base, somewhat decurrent, usually 1—2 mm. broad : petioles 0·3—1 cm. long. *Flowers* few, racemose, distant,

solitary, yellow. *Bracts* 2—3-partite, clasping, 1—2 mm. long. *Peduncles* much shorter than the internodes, stellato-pilose. *Calyx* widely campanulate, about 7 mm. long, gland-dotted, sometimes laxly stellato-pilose, the teeth 2·5 mm. long, deltoid, slightly acuminate, the sinus subangular. *Corolla* urceolate : petals 1 cm. long, the limb sub-symmetrical or rarely with an obscure auricle at the base of the outer margin, 4—5 mm. broad, as long as the arcuate claw. *Filaments* cuneate or narrowly cuneate-obovate, 3·5 mm. long, 1·8 mm. broad, with membranous wings : anthers lanceolate in outline, acute, 3 mm. long. *Ovary* oval, 2 mm. long, densely stellato-pilose, at least on the ridges : style 4·5 mm. long, very minutely pubescent. *Capsule* 6—7 mm. in diam., indented at the apex, stellato-pilose on the ridges.

Hab. Cape Province : Malmesbury Div. ; Mamre Hills, *Compton* 14928 (*type* at Kirstenbosch) ; near Yserfontein, *Salter* 1347 ; Koperfontein, *Compton* 9457 ; Darling, *Schlechter* 5339 ; Slangkop, *M. Gillett* Bol. Herb. 23340 ; Moorreesberg, *Leipoldt* Bol. Herb. 18628 : Clanwilliam Div. ; Van Putten's Vlei, *M. Gillett* 4058. Flowers Aug.—Sept.

Var. β **auriculata** Salter. *Calyx* sinibus inter lobos rotundatioribus. *Flores* flavi vel rarius albi. *Petalorum* laminae angustiores, 5—6 mm. latae, auricula gibbosa obtusa conspicua marginis exterioris basi instructae.

Sinus between the calyx lobes more rounded. *Flowers* yellow or more rarely white. Limb of the *petals* wider, 5—6 mm. broad, with a conspicuous gibbous auricle at the base of the outer margin.

Hab. Cape Province : Malmesbury Div. ; Yserfontein, *Compton* 17374 (*type* at Kirstenbosch) ; near Langebaan, *Leighton* Bol. Herb. 23339 ; Steenbergs Cove, *Compton* 15942 (corolla white).

H. pinnatisecta, judging by the leaves, is an affinity of *H. confusa* Salter, the preceding species and the imperfectly known *H. tenuifolia* Sims in Bot. Mag. It differs in its lax decumbent habit, symmetrical stipules, solitary flowers, larger corolla and calyx, the latter sparsely stellato-pilose with much less attenuate teeth and the entirely glabrous filaments.

A NOTE ON *URGINEA PYGMAEA* DUTHIE.

By R. S. Adamson.

This inconspicuous late-flowering species has recently been gathered by Captain T. M. Salter in a new locality, Rondebosch Common, where it was growing on recently burned ground. As it was previously known only from the original locality on the Stellenbosch Flats, this discovery marks an extension of the range and an addition to the flora of the Cape Peninsula.

The Rondebosch specimens have been compared with the type specimen (*Duthie* 1603 in Herb. Univ. Stellenb.) and are certainly identical. The type sheet consists of a number of specimens at different stages of development. An examination of the specimens from the Rondebosch locality has revealed, however, certain features which were either not mentioned in or which do not show real agreement with the original description and figures (Duthie, Ann. Univ. Stellenb. VI. A. 2, 10, 1928, Pl. 2). As the species is little known and as there seems a probability of its discovery in further stations, these points seemed worthy of record.

The Rondebosch specimens have 3—6 leaves per bulb not only 1—3 as described. The leaves are dark green but not glaucous and when fully developed are horizontal or prostrate on the ground. The specimen figured (l.c. fig. 2) which has erect leaves would appear to be either immature or to have been grown under abnormal conditions.

In the notes following the description, it is stated that 1-flowered scapes are commonest, 2-flowered occasional, and 3-flowered rare. These specimens have most commonly 2 or 3 flowers, some have 4, while 1-flowered specimens seem to be without doubt poorly developed individuals. On the type sheet the flowering specimens are mostly 1-flowered but the fruiting specimens are just like those from Rondebosch.

The perianth does not quite agree with the figure (l.c. fig. 10): the segments are longer in proportion to their width than is shown and are united for not more than a third their length. The stamens are attached at or above the level of union of the segments. In colour each perianth segment has a broad stripe, chestnut-brown inside, dull chocolate-brown outside, with the marginal part translucent and very thin. These brown flowers are a very characteristic feature and assist in rendering the plant inconspicuous but were not mentioned in the description. Indeed, so

inconspicuous are the flowers that their discovery on Rondebosch Common was due to observation of the bright yellow anthers not the perianth.

The seeds figured (l.c. fig. 7) are not entirely characteristic. Young seeds are tetrahedral with a very loose testa. As maturity is reached the seeds become flattened, those at the outside of the capsule becoming quite flat, those in the centre of the capsule remaining somewhat angular like those figured.

The leaves form immediately after flowering time and appear to be full grown in May or June.

U. pygmaea is most nearly allied to *U. minor* and might be confused with that species especially in the dried state (*cf.* Duthie l.c. 12 : Adamson, this Journal VIII, 242, 1942). It is distinguished by the horizontal leaves which are somewhat widened towards the tip, the short pedicels and by the brown flowers with united perianth segments. *U. minor* has erect filiform leaves, longer pedicels with the flowers in a small corymb, and perianth segments almost free and white inside.

ROELLA RETICULATA.

By R. S. Adamson.

Eighty years ago Sonder (Fl. Cap. 3, 592, 1865) stated that the rather common plant generally known as *R. reticulata* A.DC. was not the same as the plant originally described by Linnaeus under that name. As the matter has not been taken further and as the statement if true means that the generally used name is not valid, it seemed advisable to investigate the problem and attempt to reach a settlement. In what follows, very considerable help from Dr. T. A. Sprague is gratefully acknowledged.

Roella reticulata was first described by Linnaeus (Sp. Pl. ed. 1, 170, 1753) as follows :—

> Roella foliis ciliatis ; mucrone reflexo. Roella foliis imbricatis. Roy. lugdb. 248. Campanula capitis bonae spei, foliis reticulatis spinosis. Pet. mus. 21, f. 157.

The description was repeated without change in the second edition (Sp. Pl. ed. 2, 241, 1764).

As there is, according to Jackson's index, no contemporary specimen of the plant in the Linnaean Herbarium, it is not possible to ascertain directly what the plant intended really is and recourse must be had to the attached references. The figure given by Petiver for his plant is of a shoot without flowers which though quite unlike any species of *Roella* is a fair representations of *Gorteria ciliaris* L. (*Cullumia ciliaris* (L.) R.Br.). This identification is supported by the fact that Burmann (Pl. Afr. Rar. 152) quoted Petiver's plant as being the same as his *Carlina foliis imbricatis oblongis reticulatis et in aculeam aduncum desinentibus*, which is itself quoted as a reference by Linnaeus under *Gorteria ciliaris* (Sp. Pl. ed. 2, 1284, 1764).

It has not been possible to check the reference to Van Royen. However, Richter (C. Linn. Syst., etc., 181, 1840) says that the other references refer to *Gorteria ciliaris* and that *R. reticulata* is probably that plant. Linnaeus' own diagnosis is certainly more applicable to *Gorteria ciliaris* than to any species of *Roella*. The fact that in 1764 Linnaeus described *Gorteria ciliaris* but made no alteration in the species of *Roella* suggests that he was not familiar with the plant he had described in 1753. It would seem that he described it wholly from the literature and that the

figure of Petiver is the type. From Petiver's description he obtained the epithet "*reticulata*", and the position he assigned to the plant may well have been influenced by Petiver's unexplained use of the name *Campanula*.

If then *Roella reticulata* L. is really *Gorteria ciliaris*, the plant described by A. De Candolle in 1830 (Monog. Campan. 174) cannot bear that name though it is generally applied to it. When describing his species, De Candolle says that Petiver's figure, which is referred to by Linnaeus and which appears to be the type, represents a different plant. He justifies his use of the Linnaean name on account of a specimen (in Herb. DC.) which is stated to have been given to Vahl by Linnaeus himself. Though this specimen has not been seen, it cannot possibly be the type of *Roella reticulata* L. and cannot affect the argument that that name applies to *Gorteria ciliaris*. The further references that are given by De Candolle, to Lamarck and to Poiret, do not afford any help. The former (III, 2, 8, 1793) merely expands the original diagnosis by a few words and adds "Gorteriae ciliaris habitus". The latter (Enc. Meth. 6, 232, 1804) states that the species is not a Roella.

It is thus apparent that *R. reticulata* L. and *R. reticulata* A.DC. are different plants and that the latter must have another name. Three names seem available which were used for species closely allied to or even synonymous with *R. reticulata* A.DC. These are :—*R. Dunantii* A.DC. Monog. Campan. 175, 1830 ; *R. gracilis* Eck. & Zeyh. Enum. 387, 1837; and *R. prostrata* E. Mey. ex A.DC. in DC. Prodr. 7, 447, 1838.

Of these *R. Dunantii* is sufficiently distinct to retain independant specific rank. *R. gracilis* is a composite species, in part *R. ciliata* L. and in part *R. reticulata* A.DC., and so may be disregarded. The third species, *R. prostrata*, though the type specimen has not been seen, is evidently from the description closely allied to *R. reticulata* A.DC.

An examination of a number of specimens, both in the field and in collections, has shown that there is a considerable range of variation in habit, in the size and closeness of the leaves, in the presence or absence of teeth on the sepals, in the length and colour of the corolla, and in other lesser features. Indeed, there is a complex group of individuals, not sharply delimited, from which De Candolle selected two forms for description out of a much larger possible number. Whatever selection was made there appears to be overlapping in features and, until a full study of all the forms, both genetical and other, is undertaken, the only practicable course seems to be to group all of them under one species. Sonder (l.c.) seemed to realise this when he reduced *R. prostrata* to a variety. Unfortunately the characters he gives for his variety are not satisfactory.

Shortly before the issue of the volume of the Prodromus in which De Candolle described his species, the name *R. prostrata* was published by Ecklon and Zeyher (Enum. 387, 1837) but without any description. The specimens to which they attached this name are not of De Candolle's plant but are *R. spicata* L.f. De Candolle described his species quite independently and without previous knowledge of the use of the name. This is shown by the fact that the new species described in Ecklon and Zeyher's Enumeration are in the Prodromus only included in an appendix : the main body of the work was written before the other book was available.

Since it appears that *R. prostrata* A.DC. is synonymous with *R. reticulata* A.DC., and since Ecklon and Zeyher's use of the name is without description and hence without nomenclatorial standing, it is suggested that De Candolle's name be applied to the species. The synonymy is :—

R. prostrata E. Mey. ex A.DC. in DC. Prodr. 7, 447, 1838, *non* E. & Z. Enum. 387, 1837 (*nomen nudum*).

R. reticulata A.DC. Monog. Campan. 174, 1830, *non* L. Sp. Pl. 170, 1753.

R. gracilis E. & Z. Enum. 387, 1837 (p. pte.).

THE SOUTH AFRICAN QUININE TREE.

By E. P. Phillips.

In the year 1926, the National Herbarium forwarded a supply of dry bark of the "Quinine tree" to the Johns Hopkins University, U.S.A.* The material was collected from trees growing in Pondoland and was identified as *Rouvolfia caffra* Sond. (National Herbarium No. 3358.) At the time the question arose as to whether two species of *Rouvolfia* occurred in South Africa and the specimen quoted above was submitted some years later to Kew for an opinion. The Director of Kew in his reply suggested a series of specimens should be examined critically and those from the Magaliesberg—the type locality of *R. caffra*—compared with specimens from Natal (the type locality of *R. natalensis*) and Pondoland.

The writer recently had an opportunity of undertaking such an examination. The calyx may vary in length from 1·5 mm. to 2·5 mm. and the tube from saucer-shaped to shortly campanulate; the corolla varies in length from 4·5 mm. to 6·5 mm. but otherwise does not differ in the specimens examined; the stamens are similar in all the specimens; the disc surrounding the ovary may be saucer-shaped and not partly enveloping the ovary or may be cup-shaped and envelope the lower portion of the ovary; the ovary wall may be smooth or wrinkled; the style differs slightly in length but the stigma is similar in all the specimens.

The difference in leaf character given in the Key in the "Flora Capensis" to distinguish the two species does not hold good. Specimens from Natal have lanceolate leaves, while in a Burke specimen (No. 113) one leaf on the specimen is definitely oblanceolate, and a specimen from the Magaliesberg (*Pole-Evans* No. 1522) has both lanceolate and oblanceolate leaves on the same specimen. The result of the examination of a larger range of material than was available when the descriptions in the "Flora Capensis" were drawn up, indicates that there is no vegetative or floral characters which would justify us recognising two species of *Rouvolfia* in South Africa. This view is confirmed by Dr. I. J. Craib of the Division of Forestry, who informed the writer that foresters only recognise one species. The distribution of the species is quite normal. As the specific epithet "*caffra*" appeared first in Sonder's work (Linnaea, vol. 23) the name for the South African Quinine tree should be *Rouvolfia caffra* Sond. (= *R. natalensis* Sond.).

* See American Chemical Society, vol. 54, p. 2412 (1932) for results of examination

THE GENERA *CHILIANTHUS* BURCH. AND *BUDDLEJA* LINN.

By E. P. Phillips.

In the "Flora Capensis" the two genera *Chilianthus* and *Buddleja* are upheld for a group of South African plants. The distinguishing characters as given in the Key are :—

Chilianthus—*Calyx* deeply lobed ; anthers exserted.

Buddleja —*Calyx* shortly lobed ; anthers included.

The species placed under the two genera may be distinguished, however, by a more easily recognised character, viz., a campanulate corolla-tube in *Chilianthus* and a cylindric corolla-tube in *Buddleja*.

In De Candolle's Prodromus the genera are distinguished as follows :—

Chilianthus—*Calyx* 4-fid. *Corolla-tube* short. *Stamens* more or less exserted.

Buddleja —*Calyx* 4-toothed or 4-fid. *Corolla-tube* short or long. *Stamens* included.

In the "Genera Plantarum" it is stated under the genus *Chilianthus* —strongly allied to the genus *Buddleja* and differs principally on the exserted anthers. Solereder (Pflanzenfamilien) also notes that *Chilianthus* is very closely related to *Buddleja* but is distinguished by the inflorescence which is made up of numerous small flowers and also by the longer stamens. Marquard in a "Revision of the Old World Species of Buddleja" (Kew Bulletin 1930) does not mention the genus *Chilianthus* and its relationship to *Buddleja*. It is abundantly clear that all authors who have dealt with the two genera have been impelled to make mention of their close relationship.

In drawing up descriptions of the two genera for my revised edition of the "Genera of South African Flowering Plants", I had difficulty, after dissecting the material in the National Herbarium to distinguish satisfactorily the two genera. In specimens with exserted stamens some had the calyx shortly toothed, so it is clear that one of the distinguishing characters of *Chilianthus*, viz., a 4-fid calyx is not constant. The degree to which the anthers are exserted varies, e.g., in *C. corrugatus* the anthers are very little exserted.

Linneaus founded the genus *Buddleja* on a South American plant (*B. americana*) and this, according to the figure given in the "Pflanzenfamilien", has an almost 4-fid calyx, a corolla with a campanulate tube

and included stamens. We are then left with the inclusion or exsertion of the stamens as a character by which to distinguish the two genera—a character which in the species placed in the genus *Chilianthus* is not constant. The conclusion is forced upon one that *Chilianthus* Burch. must be sunk under *Buddleja* Linn. In looking through recent volumes of the " Botanical Magazine " one finds that plants with a campanulate or a cylindric corolla-tube are regarded as species of *Buddleja* and while the South African species may be placed into two distinct groups on that character alone, it does not justify them being regarded as generically distinct.

The consequential name changes will be as follows :—

B. salicifolia Jacq. = *Chilianthus arboreus* A.DC.

B. corrugata (Benth.) Phil. = *C. corrugatus* (Benth.) A.DC.

B. lobulata (*Benth.*) = *C. lobulatus* (Benth.) A.DC.

B. dysophylla (Benth.) Phill. = *C. dysophyllus* (Benth.) A.DC.

DIE ANATOMIE VAN DIE WORTEL VAN *RESTIO PALUDOSUS* EN *LEPTOCARPUS VIMINEUS*.

Deur P. G. Jordaan.

Vir 'n studie van die topmeristeem van die wortel van die Restionaceae, waarmee tans besig is, was dit nodig om die anatomie van die volwasse wortel van 'n paar soorte te weet. Die anatomie van die wortel van Restio paludosus en Leptocarpus vimineus is bepaal en aangesien weinig gegewens oor die anatomie van die wortel van die familie in die literatuur te vind is, word die resultate hier aangeteken.

Restio paludosus, Pillans.

Die wortels wat ondersoek is, was ten minste ag maande oud. Die materiaal is op die vlakte om Stellenbosch versamel waar die plante in grond wat in die winter baie nat en in die somer baie droog is, groei. Die materiaal is in Aprilmaand na die eerste herfsreëns versamel.

Die wortels van die plante is 15—25 cm. lank en ·5—1 mm. dik. Die sywortels is kort, baie dun en min vertak. Die meeste wortels het 'n bruin kleur ; sommige is effens grys. By die bruin wortels is die epidermis, die hipodermis en dikwels ook 'n groot deel van die skors tot niet.

Die wortel word na buite begrens deur die epidermis. By beide die hoof bywortels en die fyn sywortels is die meeste epidermisselle uitgegroei tot lewende wortelhare (Fig. 1 en 2). Aan die hoof wortels is die wortelhare veral volop aan die basis van die wortel naby die risoma. Die selwande van die wortelhare is baie verdik, behalwe by die punte, en bestaan uit selluloos.

Op die epidermis volg 'n hipodermis wat een sellaag in deursnee is. Die selle is lewend, halfmaanvormig en die buitewande is dun. Die radiale en binnenste wande is verdik en bestaan hoofsaaklik uit kurkstof. Meestal verdwyn die epidermis en die hipodermis sodat net die verdikte binnewande van die hipodermis oorbly.

Die bou van die skors varieer. Dis 8—12 sellae in deursnee en die binnenste sellaag is die endodermis. Die selwande van die endodermisselle is baie verdik en bestaan hoofsaaklik uit houtstof. Die selholtes is halfmaanvormig (Fig. 3 en 4). Aan die buitekant van die endodermis lê

altyd 1—4 lae dikwandige, reghoekige selle, sonder intersellulêre ruimtes. Die selwande bevat stippels en die selholtes is nou (Fig. 3 en 5).

Die deel van die skors wat lê tussen die laasgenoemde sellae en die hipodermis, bestaan uit óf (i) net dunwandige, parenchymatiese selle met klein intersellulêre ruimtes (Fig. 3) óf (ii) net dunwandige parenchymatiese selle met groot intersellulêre ruimtes (aerenchyma) óf (iii) 'n buitenste en 'n binnenste deel met dikwandige, veelkantige selle, sonder intersellulêre ruimtes, met dunwandige parenchyma, met intersellulêre ruimtes (Fig. 3a), tussen in. Wanneer die buitenste lae van die skors uit dikwandige selle bestaan, strek die parenchyma plek-plek tot teen die hipodermis of epidermis en vorm op hierdie wyse 'n soort pneumatode (Fig. 1b).

Die sellaag van die skors wat grens teen die hipodermis, is geïnterpreteer as die exodermis. Meestal is die wande van die exodermisselle, afgesien van die buitenste verkurkte wande (= die binnewande van die hipodermis) dun. Soms word al die wande, hoofsaaklik deur selluloos, verdik (beginnende by die radiale wande) en dan strek die verdikkings meestal tot die aangrensende skorsselle sodat 'n exodermis wat uit verskeie lae dikwandige selle bestaan, gevorm word (Fig. 1 en 2).

Die stele word na buite begrens deur die perisikel wat uit 5—8 lae selle met dik, rooibruim wande bestaan (Fig. 3, 4 en 5). Die selle is 5—8 maal langer as breed (Fig. 5), meestal parenchymaties en belaai met setmeel. Die selwande bestaan hoofsaaklik uit lignin (getoets met phloroglucin plus salpetersuur) en bevat talryke eenvoudige stippels.

Die vaatweefsel is 20—30 sellae in deursnee. Die floëem vorm talryke klein bundels wat in 'n sirkel gerangskik is (Fig. 1 en 4). Versprei in die xileem—soms tot in die middel van die stele—lê ongeveer 30 groot, wye houtvate met hofstippels. Al die selle om en tussen die houtvate het dik, verhoute selwande (Fig. 4) en bêre setmeel. Die bou van die selle kom ooreen met dié van die perisikel, hoewel die wande meestal meer verdik is—dikwels tot so'n mate dat die selholte heeltemal verdwyn. Die enkele prosenchymatiese (skerppuntige) selle in die xileem verskil nie in lengte van die parenchymatiese selle nie.

Leptocarpus vimineus, Pillans.

Die habitat waar die materiaal van *L. vimineus* versamel is, kom in hoofsaak ooreen met dié van *R. paludosus*. Die grond is vermoedelik beter gedreineer. Die wortels kom uitwendig ooreen met dié van *R. paludosus*, behalwe dat hierdie soort meer sywortels vorm. Die sywortels is baie dun en meestal baie vertak.

Die anatomie van die wortel verskil baie min van dié van *R. paludosus*.

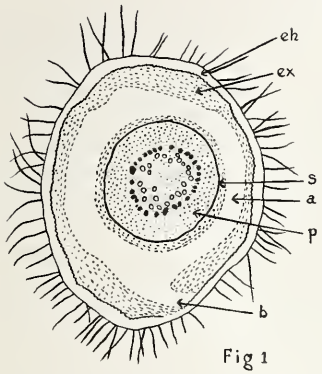


Fig 1

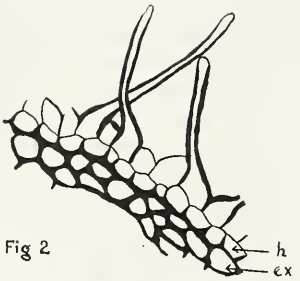


Fig 2

Fig 3

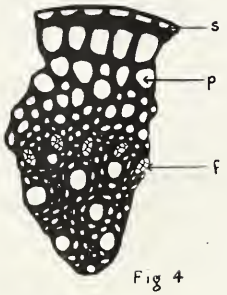


Fig 4

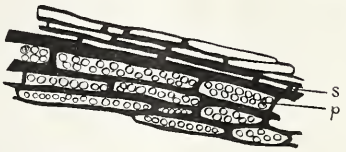


Fig 5.

Restio paludosus. Fig. 1. Dwarssnit van 'n ou wortel. a = dunwandige parenchyma in die skors ; b = pneumatode ; eh = epidermis en hipodermis ; ex = exodermis ; p = perisikel ; s = endodermis. In die stele stel die kring swart merke die floëem en die klein sirkels die houtvate voor. Vergr. 40. Fig. 2. Epidermis, hipodermis (h) en 'n deel van die exodermis (ex) van 'n ou wortel. Vergr. 225. Fig. 3. Endodermis (s) en omringende weefsels in 'n volwasse wortel. c = dikwandige selle in die skors. Vergr. 225. Fig. 4. Dwarssnit van 'n volwasse wortel vanaf die endodermis tot die middel van die stele. f = floëem. Vergr. 200. Fig. 5. Lengtesnit van 'n volwasse wortel om die endodermis en die omringende weefsels aan te toon. Vergr. 225.

Geen wortelhare is aan die ou wortels gevind nie. Die wortel word na buite begrens deur die verkurkte buitewande van die exodermis. Die exodermisselle kom origens ooreen met die aangrensende selle van die skors of die binnenste en radiale wande is ook verdik. Soms strek die verdikkings op sommige plekke tot die aangrensende skorsselle.

Tipies bestaan die grootste deel van die skors uit dunwandige, veelkantige, parenchymatiese selle. Een of twee lae selle teen die endodermis is langwerpig en nou met dik wande. Hierdie meganiese selle teen die endodermis is swakker ontwikkel as by *R. paludosus*. Die selwande van die endodermisselle is nie prominent verdik nie. Die selholtes is feitlik reghoekig en die selle is gepak met setmeel.

Die anatomie van die stele van die twee soorte is wesenlik dieselfde. By *L. vimineus* is die selwande in die perisikel tot so 'n mate verdik dat die lumens van die meeste selle baie klein is. Die toename in wanddikte verloop sentrifugaal. Soms is die lumens van net die buitenste laag selle prominent—soms is hulle ook baie klein. Behalwe dat die floëembundels meestal kleiner is, kom die vaatweefsel ooreen met dié van *R. paludosus*.

Bespreking.

Die anatomie van die volwasse wortels van *R. paludosus* en *L. vimineus* kom baie ooreen. Die volgende is die belangrikste verskille : (i) Wortelhare is aanwesig op die ou dele van die wortels van *R. paludosus*. (ii) Die bou van die skors van *R. paludosus* is variabel en bevat meestal meer dikwandige selle ; soms aerenchymaties. (iii) Die wande van die endodermisselle is dikker by *R. paludosus* as by *L. vimineus*, terwyl die selholtes by eersgenoemde in dwarssnit halfmaanvormig en by laasgenoemde reghoekig is. Die setmeelkorrels is ook meer opvallend in die endodermisselle van *L. vimineus*. (iv) Die selwande in die perisikel van *R. paludosus* is minder verdik as dié van *L. vimineus*. Verskille 2—4 kom daarop neer dat die stele van *L. vimineus* tipies baie meer dikwandige selle bevat as dié van *R. paludosus*.

Alhoewel geen hipodermis by *L. vimineus* waargeneem is nie, kan sy aanwesigheid veronderstel word op grond van die U-vormige buitewande van die exodermis. Die punte van die U kon uit die radiale wande van die hipodermis ontstaan het soos by *R. paludosus*.

Die algemene bou van die wortels van die Restionaceae is deur Gilg (1891) beskrywe. Hoewel hy vermoedelik nie die wortels van *R. paludosus* en *L. vimineus* ondersoek het nie, weerspreek die resultate wat hier t.o.v. die stele aangeteken is, nie die bevindings van Gilg nie. Die resultate t.o.v. die dele buitekant die stele verskil van dié van Gilg. Die herbarium materiaal waarmee genoemde skrywer moes werk, sou

nie geskik gewees het nie vir die studie van die skors indien dit uit dunwandige selle bestaan het, soos b.v. by die twee soorte wat hier beskrywe is.

Gilg maak geen melding van 'n hipodermis of 'n exodermis nie. Vir die studie van die skors het die genoemde skrywer net ou, gedroogde wortels gebruik en dis nie onwaarskynlik dat wortels ondersoek is waarvan die buitenste deel van die skors afgeskilfer was, soos soms waargeneem is by *R. paludosus* en *L. vimineus*.

Dis nie duidelik of Gilg wortelhare aan die ou dele van die wortels waargeneem het nie. Hy sê (bls. 581) „Fast bei allen den von mir untersuchten Wurzeln sind die oberflächlichen Zellen (Epidermis) zu mehr oder weniger langen, dünnen und zartwandige Haaren ausgewachsen." By die beskrywing van die skors sê hy (bls. 582) „Alle die Wurzeln, welche mir zu Verfügung standen waren schon vollig ausgebildet und hatten gewiss ihr wachstum . . . schon beendigt". Die laaste sitaat kan betrekking hê net op die wortels waarvan hy die skors ondersoek het of op al die wortels wat hy ondersoek het—dus ook op dié waarvan hy die wortelhare gevind het. Dikwandige hare, soos dié wat by *R. paludosus* voorkom, het Gilg nie waargeneem nie.

Verskeie gevalle is reeds bekend waar wortelhare langlewend is en op volwasse wortels voorkom. Whitaker (1923) kom tot die gevolgtrekking dat permanente wortelhare algemeen voorkom by kruidagtige plante waarvan die wortels geen sekondêre verdikking ondergaan nie.

SUMMARY.

1. The anatomy of the full-grown roots of *Restio paludosus*, Pillans and *Leptocarpus vimineus*, Pillans, is described.

2. The anatomy of the roots of the two species are very similar.

3. Many of the old roots of *R. paludosus* are covered with thick-walled root hairs (Fig. 1 and 2).

4. The epidermis is followed by an hypodermis. The radial and inner cell walls of the hypodermis are suberised and persistent (Fig. 2). In most roots, especially in *L. vimineus*, these suberised walls form the external boundary of the root.

5. The hypodermis is followed by an exodermis consisting of one or more layers of cells. Sometimes only the outer walls of the exodermis cells (=inner and radial walls of the hypodermis), sometimes also the radial walls and in some cases all the cell walls of the one or more layers are thickened (Fig. 2).

6. The innermost layer of the cortex is the endodermis with crescent-

shaped cell spaces in *R. paludosus* and rectangular cell spaces in *L. vimineus*. The cell walls are thickened (Fig. 3 and 4).

7. On the outside of the endodermis are 1—4 layers of narrow cells with thickened walls (Fig. 3 and 5).

8. The cortex consists chiefly of polygonal, thin-walled, parenchymatous cells with small intercellular spaces (Fig. 3). In *R. paludosus* the cortex is sometimes aerenchymatous.

9. The pericycle consists of 5—8 layers of cells with very thick, brown walls with simple pits. These cells store starch (Fig. 4 and 5).

10. The vascular tissue comprises the central part of the root. The small phloem bundles are arranged in a circle in the periphery of the vascular tissue. The walls of the elements of the xylem are thick and lignified. The vessels are scattered and in between them are many thick-walled, parenchymatous cells storing starch. Sometimes the centre of the stele is occupied only by these starch-storing cells (Fig. 1 and 5).

11. The results relating to the tissues of the root external to the stele differ from those of Gilg.

12. It is uncertain whether Gilg noticed root hairs on the old roots of the *Restionaceae*. According to Whitaker, persistent root hairs are of common occurrence in herbaceous plants when the roots do not undergo secondary thickening.

LITERATUURLYS.

Gilg, E., 1891 .. Beiträge zur vergleichende Anatomie der xerophilen Familie der Restiaceae. Engler's Bot. Jahrb., vol. 13, deel 5, bls. 541.

Whitaker, E. S. .. 1923. Root hairs and secondary thickening in the Compositae. Bot. Gaz., vol. 76, bls. 30.

REVIEWS.

A Botanist in Southern Africa, by J. Hutchinson. With a foreword by Field-Marshal The Rt. Hon. J. C. Smuts. London: P. R. Gawthorn, 1946. Pp. xii and 686. Numerous illustrations. 56/3 net.

This imposing volume is the largest and possibly the most important work on the flora of South Africa that has appeared for a long time. It is not a flora nor a description of the vegetation, but is a record of the journeys made by the author in the Union in 1928-9 and on a trip to Lake Tanganyika in 1930. The whole book is arranged on the sequence followed on these journeys.

This is a book for the botanist. While there are mentions of people, customs, scenery, roads and so forth, plants occupy very much the largest part. The author is a real enthusiast for plants and plant collecting and the reader is conscious of his enthusiasm bubbling over on almost every page. He writes with an assurance that his enthusiasms are shared. His joy in the finding of plants unknown to him or of plants with curious or interesting features of structure or distribution, is faithfully recorded.

Along with the notes on his travels and lists of the plants collected, often placed as footnotes, there are numerous annotations on identification, nomenclature, some descriptions of new species or varieties, and comments on distribution and affinities. The fact that all this information is arranged according to the sequence of its observation by the author on his various journeys, makes the book somewhat difficult to read consecutively. But taken portion by portion there are features that everyone will find of interest and of importance from some point of view or other. It is unfortunate that a work based upon this plan and one containing such masses of rather detached information is not provided with an index or even with a full synopsis. This makes reference to and the finding of the items of information unnecessarily difficult.

The book is divided into five parts. Part I deals with the S.-W. Cape, Namaqualand and the Karroo, and is the fullest. This was the author's starting point, and it was here that he was studying a flora with

less affinity with those of other regions than on the rest of his wanderings. He comes out as a strong supporter of the view that this Cape flora is of southern origin and he quotes many examples of its association with the flora of Australia. Part II is much shorter. It covers journeys to George, Port Elizabeth, Natal and on to Pretoria. Included here is a list of the principal trees of the Knysna forests with their distributions both in S. Africa and outside. There are also five pages of drawings of leaves of these trees. Part III, which covers the northern part of the Union, is rather more detailed. The flora here is allied to that of tropical Africa, upon which the author is an authority. At the end of this part is an account of the return journey to Cape Town by way of the central Karroo, Little Karroo and Hermanus. This makes the lack of an index apparent. The notes on these areas are quite separated from those on neighbouring regions. Part IV is an outline sketch of the trip to Lake Tanganyika and back. Part V deals with some general features. It opens with a sketch of the floral regions of S. Africa. Fifteen are recognised. Each of these is given a separate map to show its extent, a curious arrangement which has no obvious advantages over a single combined map. This is followed by a summary of the literature dealing with the flora arranged chronologically and extending from 1644 to 1944. This list should prove most useful to all workers on the flora. A short historical account of the exploration of the flora follows, in which the travels of Thunberg and of Burchell are treated more fully than others. At the close is a chapter on the author's arrangement of the families of flowering plants on a phylogenetic basis. A chart of the supposed relations is given, but this chapter is too short to be of much value to those not already familiar with the subject.

The volume is lavishly illustrated. There are numerous reproductions of the author's photographs, nearly all of which are clear and distinct, also a large number of his own drawing of plants that he found, and many maps and diagrams. In addition, there are incorporated as whole-page plates about fifty of Dr. Pole-Evans' superb photographs of vegetation. The wealth of illustration alone makes the book of great value and this will undoubtedly be its principal appeal to the non-botanist. The general get-up and type is excellent, a very few mistakes occur in the placing of footnotes.

While botanists will not all agree with all the views expressed by the author, they must all unite in congratulating him on the production of a unique book and one with great general interest and much scientific value. A final word may be said in praise of the striking and most uncommon dust-cover.

R. S. Adamson.

Forest Soils and Forest Growth. By S. A. Wilde, Sc.D. Univ. of Wisconsin, U.S.A. Published by Chronica Botanica Company, Waltham, Mass., U.S.A., Central News Agency, Ltd., Johannesburg, Union of S.A. A New Series of Plant Science Books, Vol. 18; Sup. roy. Oct., buckram, 241 pp., 20 tables, 7 plates. Price 5 dollars. 1946.

This book provides an admirable general introduction to the study of forest soils and forest growth. The traditional European literature has been capably condensed and combined with the contributions made in modern publications to form a coherent account which bears the distinctive features of scientific forestry. The references are very liberal and over 600 publications are listed. Quotations from classical literature, some of considerable historical interest, head the various chapters and enliven the text.

In the first historical and introductory chapter, forest soil is described as a "portion of the earth's surface which serves as a medium for the sustenance of forest vegetation; it consists of mineral and organic matter, permeated by varying amounts of water and air, and inhabited by organisms; it exhibits peculiar characteristics impressed by the physical and chemical action of the tree roots and forest debris." Forest soils are thus not merely soils where forests can grow, but soils that have been built up, enriched in organic material, and given a characteristic structure under a covering of forest vegetation. Thereby forest soils are distinguished from agricultural and waste soils, and this close interrelationship between the soil and the forest crop justifies the treatment of forest soils and forest growth in one volume.

In the second chapter the genesis of soils is described. Weathering, differentiation of the soil profile, the relation of soils to climate, parent material, topography and vegetation, and the influence of time in the formation of soil are briefly referred to. The author associates desirable "mull humus" with hardwood species, and acid "mor humus" with conifer species, but this is somewhat arbitrary, because these processes may be strongly influenced by silvicultural treatment and other factors. Acid humus is most frequently formed in dense stands, in cold localities, on soils deficient in lime, and these conditions apply more often in conifer than hardwood stands.

The classification of genetic soil groups and their descriptions, given in chapters III and IV, are concise and clear. Some doubt is, however, felt about the use of the title "Charral Soils" for the group carrying sclerophyllous vegetation, which is derived from the name applied to sclerophyllous forest in Latin America. The dominating influence on the formation of sclerophyll vegetation and the soils associated with it

is the characteristic Mediterranean climate, marked by a wet winter, long dry summer and mild temeratures throughout the year. Some title referring to such a climate, or better still to a common feature of the soils in the group, would have been preferable. Confusion may also result because this type of vegetation is called " Chapparal " in California. It is not advisable to associate a local name of vegetation with a widely distributed soil group. Wilde writes of soils belonging to this group that they " produce returns, under planned management incomparably greater than do most other groups of forest soils ". An outstanding example of this is furnished by the successful cultivation of *Pinus radiata* D.Don (*P. insignis*) in the south-western Cape.

Chapter V, dealing with the forest cover, is somewhat fragmentary. Some of the short paragraphs under sub-titles, such as " Mass Action of the Forest " and " Succession and Soil Development ", could well have been expanded into whole chapters.

Physical and chemical properties of soils are reviewed in chapters VI and VII. In contrast to older literature, the importance of chemical properties is quite rightly stressed and it is clearly established that forest pedologists have in the past been too preoccupied with the water relationships and physical properties of soils.

Organisms of forest soils are described in chapter VIII. For determining the number of micro-organisms in the soil only the method of counting colonies of bacteria and fungi cultured from sampled suspensions on nutrient agar, is given. Exact counts are, however, done directly under the microscope. Omissions of specialised information such as this do not detract from the value of the book as a general account of forest soils, and this chapter as well as chapters IX—Forest Humus, X—Soil-Forest Types, XI—Forest Soil Survey, XII—Soils and Tree Planting, XIII—Amelioration of Forest Soils, XIV—Silvicultural Cuttings in Relation to Soils, are adequate as general introductory accounts of these subjects. Forest officers will, however, have to consult more specialised literature, and also rely largely on their own experience, when they desire to investigate soils and apply field observations in practical forestry.

The book would not have suffered had chapter XV been excluded. The information given is too general to be of practical value and the subjects—preparation of yield tables, determination of annual cut, calculation of expected financial return of reafforestation investment, evaluation of forest land, appraisal of damage to the productivity of forest land—have been very fully dealt with in many other publications which are readily available. The space could well have been used to expand other sections of the book.

The remaining chapters, XVI to XX, deal with nursery soils. These accounts are of considerable general interest. Most of the problems discussed, however, pertain to the raising of nursery stock in beds, and in South Africa such problems are, for the most part, avoided by raising nursery stock in trays. This is made possible chiefly because the plants of tree species used here need to remain in the nursery for only about one year. Fresh nursery soil is used every year, and it is returned to the field without much loss because " ball "-planting is almost universal. Under this system the control of watering presents no problem, no fertilizers or manures are needed, soils are readily mixed to the desired sandy-loam consistency, and the development of parasitic organisms in a soil is easily controlled.

The author repeatedly refers to Rubner's " Die Pflanzengeographischen Grundlagen des Waldbaus," 2nd edition, 1925. A revised and enlarged third edition of this valuable reference work was, however, issued in 1934. A fourth, enlarged, edition of Warming's " Lehrbuch der Ökologischen Pflanzen-geographie " issued by Gräbner in 1933, is also not referred to.

In the preface the author states : " The first draft of this book originated from my lectures as prepared for a rather heterogeneous group of students, including graduates and upper-class men in soils, forestry, botany, game management and landscape architecture." The book clearly derives its character from the manner in which it originated, and it is obviously not intended for the specialist, but as a text for students it can be strongly recommended. It will hold the interest of the student because of the lively, easy style in which it is written. For this reason it might also appeal to a wider public and possibly it might also help to stimulate a renewed interest in forest soils with South African forest officers. Few serious soil problems have so far been encountered in the extensive afforestation programme which is being undertaken by the State, but experience in all parts of the world indicates that such problems may be expected. Possibly the time has now come to initiate intensive soil investigations so that trends in soil development under newly-established plantations of exotic trees may be determined and soil problems anticipated by appropriate modifications in silviculture. Professor Wilde's book fills a need by providing a first connected, general account in English of this important subject.

C. L. Wicht.

JOURNAL

OF

SOUTH AFRICAN BOTANY

VOL. XII,

CARL PETER THUNBERG.

AN EARLY INVESTIGATOR OF CAPE BOTANY

Part IV.*

(With Plates IV - VII.)

By Mia C. Karsten.

HERBARIUM THUNBERGIANUM.

In the Institute of Systematic Botany (the former Botanical Institute) of the University of Uppsala,—that old town with its many reminiscences of the great Carolus Linnaeus, the father of the vegetable system, such as "Hammarby", the country-seat which once belonged to this gifted botanist, but later on passed into public property; with its magnificent Cathedral (Domkyrkan) in which among other famous people of Sweden's past Linnaeus is buried; with its world-famed University founded as early as 1477, and Royal University Library (Kungl. Universitetets Bibliotek) with its marvellous collections of books, manuscripts and incunabula, of which the Silver Bible or Codex Argenteus is of particular interest; with its imposing Castle on a high and commanding position (the town is crossed by a glacial ridge) and its small canalized river, the Fyrisan, with an old water-mill in the near vicinity of the Cathedral,—the Thunberg Herbarium is housed.

The quaint old building in neo-classic style of the Institute erected in the middle of the small botanical garden (Universitets Trädgård or Hortus Botanicus Universitatis Upsaliensis), is bounded on one side by

* Parts I, II and III of this series were published in the Journal of South African Botany vol. V (1939) pp. 1, 87 and 105 respectively.

the Thunberg Vägen, a road which is easily reached when passing along the square and stately building of the Kungl. Universitetets Bibliotek.

At the time of our visit in the summer of 1937 we found under one roof as much as a lecture-room, a laboratory for the students, the botanical museum where the THUNBERG Herbarium is kept, and several smaller rooms. Since no other door than that of the lecture-room opened to the museum, students could not have access to it when the professor was lecturing! The interior of the building is characterized by its many flights of stairs; the lecture-room, museum (herbarium) and laboratory were all upstairs. However, the use of the old historic building has been restricted since to the systematic department and museum, a new laboratory building, housing the Institute of Physiological Botany (Director Prof. E. MELIN) having been erected.

The THUNBERG Herbarium has a history of its own, and some interesting records are found inter alia in JUEL'S " Plantae Thunbergianae " (1918), pp. 19-20, a work that is quite indispensable for anyone who wants to examine and study this collection.

The herbarium was originally presented by THUNBERG to Uppsala University in 1785, in order to fill the void caused by a deplorable act of the widow of the great LINNAEUS who sold the unique and priceless herbarium of her late husband to the English botanist Sir JAMES EDWARD SMITH. MACOWAN[197]) narrates that in vain the Swedish Government sent a swift corvette to overtake the vessel bound for England in which it had been consigned, charged to capture the treasure at all risks. But unfortunately it was lost to Sweden, so THUNBERG offered his own very rich herbarium which, according to his own statements, contained 15,050 species, including 23,510 specimens. During his life many more specimens were added to the original collection, and to this day the Herbarium Thunbergianum has been kept in the same state as THUNBERG left it.

The history of the old building of the Institute of Systematic Botany is closely linked up with that of the THUNBERG Herbarium. King GUSTAV III who had been rather vexed about the Linnean herbarium having so secretly left the country, was so utterly pleased with THUNBERG having made the Royal University of Uppsala a present of his collections of

[197] PETER MACOWAN, " Personalia of Botanical Collectors at the Cape," Transactions of the South African Philosophical Society, Vol. IV, 1887 (originally read before the Society as his presidential address, July, 1886).

Re-published and compiled by J. H. VERDUYN DEN BOER, Dip. Libr. Amsterdam, under the title: Botanists at the Cape I, Biographical Notices of Cape Botanists. With 21 portraits.—A souvenir for the Botanic Section of the Combined Meeting of the British Association and the S. African Association for the Advancement of Science, held at Capetown, July, 1929.

naturalia (in addition to his herbarium, no less than 25,000 insects !) that he erected at his own expense the large institution building in neo-classic style which up to this day contains the botanical museum combined with a conservatory. Although it was built in the years of war 1789 and 1790, it was not until 1807—at the centenary of LINNAEUS' birth—that the building could be inaugurated, which took place with much ceremonial and an opening address by Prof. THUNBERG. The building was on the grounds of the former garden of Uppsala Castle, which at THUNBERG'S instigation was given up by the King to the University for a new botanical garden in 1784. The site of the old Linnean garden at Svartbäcken (Uppsala) in a low-lying tract of the town was exposed to constant floods in the spring, and was therefore unsuitable for the purpose[198]).

After this historical introduction we may pass on to the herbarium itself.

Apart from many specimens collected in Sweden, especially in the Uppsala Botanic Garden (plant collecting in botanic gardens—though we may recall that ABR. BÄCK[199]) made some collections in the botanic garden in Paris—sounds rather strange to the botanist of to-day !), this most important and extremely valuable herbarium includes hundreds of specimens THUNBERG collected himself at the Cape and on his journeys in the Far East.

However, the THUNBERG Herbarium does not exclusively comprise THUNBERG specimens, but also a number of plants sent to him by other botanists and collectors, and as JUEL informs us, the most numerous contributions originate from OLOF SWARTZ (Jamaica) and ROBERT BROWN (Nova Hollandia). The following are also represented by a fair number of specimens : DAHLBERG (Surinam), FREYREISS (Brasil), FRANCIS MASSON (*Cape*, Teneriffa), ANDERS SPARRMAN (*Cape*), W. ROXBURGH and J. P. ROTTLER (India), G. FORSTER (New Zealand and Terra del Fuego),

[198] These records have been taken from various THUNBERG biographies, viz.: C. A. AGARDH, " Biographie öfver Carl Petter Thunberg," in Kongl. Svenska Vetenskaps Acad:s Handlingar för år 1828—Stockholm, 1829. (Transact. of the Royal Swedish Academy of Science).—German translation by Dr. GOTTLIEB MOHNIKE : " Die Schwedischen Naturforscher Karl Peter Thunberg und Johann Wilhelm Dalman," Stralsund, 1831. For further particulars about this biography and C. A. AGARDH see footnote 221.

NILS SVEDELIUS, " Carl Peter Thunberg 1773-1828. Ett tvåhundraårsminne," in Svenska Linné-Sällskapets Årsskrift, Årgång XXVII, 1944.

Ibid., Abstract of it in English (C. P. Thunberg on his Bicentenary) in the American journal Isis, Vol. XXXV, Part 2, No. 100, Spring, 1944, pp. 128-134.

ARVID HJ. UGGLA, " Carl Peter Thunberg," in Natio Smolandica VIII (1945), Årsskrift utgiven av Smålands Nations Kamratförening i Uppsala.

[199] *Vide* C. P. Thunberg II, Journ. of S. Afr. Botany, Vol. V, Part III, July, 1939, p. 92.

P. S. Pallas (Siberia), Chr. Steven (South Russia), K. L. Ph. Zeyher (Sicily).

Originally Thunberg classified the herbarium according to the system of sexual characters modified by him, which he used in his floras and which comprised 20 classes, while Linnaeus' classes XX—XXIII according to the characters based on the stamens were included in the preceding 19 classes.

Various catalogues of the Thunberg Herbarium from different periods are still kept, two of these having been written by Thunberg himself.

We have only seen the latest catalogue, dated 1820, forming two heavy volumes of folio size bound in leather. This catalogue was written by G. Wahlenberg[200]) (*vide* Plate IV.) who was Botanical Demonstrator at Uppsala University from 1814. In this catalogue the Thunberg Herbarium has been classified according to the original Linnean system, evidently to facilitate the including of the many additional genera in places of the system where they are introduced in ater editions of Linnaeus' publications.

The title-page of the Wahlenberg catalogue reads as follows:

CATALOGUS
Naturalium
Academiae Upsaliensis
Herbarium
Tom: I Tom: II
1820.

Tom. I runs to 796 pages, while tom. II contains 393 pages apart from the Index Generum inserted at the back of the volume.

[200] Göran Wahlenberg, who succeeded Thunberg as a professor of botany at Uppsala University, was born at Kroppa in Värmland, October 1, 1780, and died at Uppsala, March 22, 1851. In 1806 he became a medical doctor and in 1829 he was called to occupy the chair of medicine and botany at Uppsala.

Wahlenberg who travelled widely for scientific purposes, showed himself to be a keen-sighted explorer. He attempted several botanical-geographical expeditions to Lapland (4 times !), Norrland and Finmark in Norway, and to the high mountains of Central Europe, viz. the Swiss Alps and the North Carpathians. He was a first-rate botanist and a highly meritorious plantgeographer, and he should be regarded as the founder of physical plantgeography. He treated the Phanerogamae as well as the Cryptogamae, and of the former he published a monograph. He was also the author of other valuable botanical publications, including his "Flora Lapponica" (1812), "Flora Carpatorum Principalium" (1814) and "Flora Suecica" (1831-33).

The above data have been taken from Acta Horti Bergiani, Bd. III, No. 3 (1905), p. LXVIII of the preface, and p. 57. Wahlenberg's portrait included with this article is from the same source.

We may add to this that his name is commemorated in the genus *Wahlenbergia* Schrad. (Campanulaceae), a large and widely-dispersed genus, chiefly from the southern hemisphere, and represented at the Cape by ca. 46 species.

The paper has been written on one side, the left pages of the catalogue having been kept blank for notes.

At the head of each page the tribus and classis are mentioned, like MONANDRIA—Monogynia, sometimes followed by the name of the genus.

This catalogue gives an enumeration of no less than 1863 genera.

At the back of each volume we find the following official statement[201]) (*vide* Plate V.) :

Att Deñe växt-Cataloge är enlig med skedd inventering, och de antekningar Inventerings Protocollet vidare innehåller intyga.

Upsala ut Supra.

L. G. Rabenius[202]).	N. F. Biberg[203])
tillkallad invent. man.	kgl. Acad. n.v. Rector
C. P. Thunberg	Ad. Afzelius[204])
Profestus Musei.	tillkallad invent. man
	Göran Wahlenberg
	Botan. Demonstrator.
	Gabriel Marklin.[205])

This " protocol " must have been written in the spring of 1819, as N. F. Biberg was a Rector of the University only during the spring term of 1819 and earlier during the autumn term of 1812.

[201] Transl. : That this catalogue of plants is in accordance with the drawing up of the inventory which has taken place, and with the notices which the protocol of the drawing up of the inventory contains further, is testified by :

Upsala as above.

L. G. Rabenius	N. F. Biberg
appointed invent. man.	R. Acad. n.v. Rector
C. P. Thunberg	Ad. Afzelius
Profestus Musei.	appointed invent. man.
Gabriel Marklin.	Göran Wahlenberg
	Botan. Demonstrator.

[202] Lars Georg Rabenius (1771-1846), " Jurisprudentiae, Oeconomiae et Commerciorum Professor " at Uppsala from 1807-37. He was one of the most famous Swedish jurists and author of valuable works on political economy. In 1837 he was knighted.

[203] Nils Fredrik Biberg (1776-1827) became a professor of philosophy at Uppsala University in 1811.

[204] Adam Afzelius (1750-1836) was appointed a " Materiae Medicae et Diaet. Professor " at Uppsala in 1812 and published some autobiographic notes by Linnaeus with annotations and an addendum (" Egenhändiga anteckningar af Carl Linnaeus om sig sjelf med anmärkningar och tillägg," Uppsala, 1823).

[205] Gabriel Marklin (1777-1857) was an Amanuensis at the Museum of Natural History of the University of Uppsala from 1824-1852. (Probably he was appointed, if not officially, as early as 1819). In 1857 the honorary degree of doctor of philosophy was conferred on him. He is known as a collector of " Dissertationes Academicae " and between 1830 and 1840 a collection of 23,000 pamphlets was sold to the Kungl. Biblioteket (R. Library) at Stockholm. His very large collections of insects, shells, etc. were bequeathed to Uppsala University. He got his livelihood mainly by selling scientific pamphlets.

Under THUNBERG's successors G. WAHLENBERG and E. M. FRIES[206] the herbarium remained in its original state. But then a period of inconceivable neglect followed, and when TH. M. FRIES[207] was appointed a professor of botany and director of the Botanical Museum, he found the cases of the THUNBERG Herbarium empty, the entire collection having vanished! Later on the herbarium was re-discovered in the greatest disorder on the very bottom of the old building of the Museum! Fortunately only a very few specimens of the collection were lost. TH. M. FRIES had the collection arranged according to WAHLENBERG's catalogue and replaced it in the same old cases where it is still kept to this day.

Originally THUNBERG mounted his plants on rather thin paper of smaller size, viz. 21 × 33 cm. We know from a quotation from the "Travels"[208] that he glued on the specimens during his journeys. Needless to say, the imperial paper he writes about is this thin smaller sized quality. Only a few specimens of the herbarium, for the greater part non-identified ones, still show the original fitting. Later on, after his return to Sweden, THUNBERG used stronger paper of larger size, viz. 24 × 37 cm., and the greater part of the older specimens were detached from the old paper and remounted upon the new one. In many cases he tore the lower margin from the old sheets, containing some notes, and attached these to the new paper.

THUNBERG himself added the scientific names to most specimens of his herbarium; he wrote these in the right-hand lower corner of the sheets. In cases where a species was represented by more than one specimen, he marked the sheets upon which the specimens were mounted,

[206] ELIAS MAGNUS FRIES (1794-1878), professor of botany at Uppsala from 1851-1859, was an authority on the Scandinavian flora. He was also famous for his study of the gen. *Hieracium* and of the Hymenomycetes.

[207] THORE MAGNUS FRIES (1832-1913) was a son of E. M. FRIES. He too became a botanist and was a professor of botany at Uppsala University from 1877-99. He took part in the two arctic expeditions of Prof. NORDENSKJÖLD (1868 and 1871) in which he investigated the vegetation of the Beren-Island, Spitzbergen and Greenland. He was well-known because of his profound knowledge of the Lichenes and has left many botanical publications. It was through his good offices that LINNAEUS' old country-seat "Hammarby" near Uppsala was acquired by the Swedish Government by which it was preserved for posterity. Moreover he deserved well of the botanical world by editing LINNAEUS' correspondence.

He was the father of ROBERT E. FRIES (born 1876), professor of botany at Stockholm University and a former director of the Hortus Bergianus (Bergianska Trädgården) from which office he retired in 1941, and also secretary of the Kungl. Vetenskapsakademien (Royal Academy of Science).

The FRIES family apparently does not feel like breaking with the botanical tradition, Prof. ROB. E. FRIES' elder son having taken up the study of botany too!

The above data about E. M. and TH. M. FRIES have been partly taken from Dr. C. A. BACKER, *Verklarend Woordenboek*, pp. 223-24. (1936).

[208] *Vide* part II of this account, Journ. of S. Afr. Botany, July, 1939, p. 93.

either with Greek letters (which he usually did) or with consecutive numbers. Consequently no varieties are indicated with α, β, γ, etc.

In the left-hand lower corner of the sheet we find in several cases names, synonyms or quotations of figures. However, the country of origin (without stating the exact locality !) and the name of the collector he usually wrote on the back of the sheet in the left-hand top corner. So many of the sheets with Cape specimens are marked on the back : " *e Cap. bonae* (or *b.*) *spei. Thunberg*," fewer : " *e Cap. bonae spei. Masson* or *Sparrman*," which may be abbreviated in this account by " Cap. Thunberg," " Cap. Masson," etc.

It is much to be regretted that THUNBERG did not indicate the localities where he gathered the specimens, but as localities are often mentioned by THUNBERG in his " Flora Capensis," he must have kept some separate record of them[209].

Prof. T. T. BARNARD who has made a special study of Cape Iridaceae and has a good knowledge of the species represented in the THUNBERG Herbarium from the late N. E. BROWN'S writings and personal correspondence with that outstanding systematist, has called our attention to the fact that according to N. E. BROWN'S lists of THUNBERG'S sheets there are some surprising second and third sheets included which are not at all like the type and from which it would appear that THUNBERG was not a very good botanist ! But in many cases these sheets are not his collection, but SPARRMAN'S or MASSON'S and there is some good reason to assume that THUNBERG incorporated them into his collection under his own sheets without paying any special attention to them, from which it may be concluded that he was not very interested in the work of others—even a great man may have his little weaknesses. . . . .

Finally it may be mentioned that in several cases THUNBERG has altered the names which he had originally written with the plants. He erased the old name with a knife and replaced it by another one.

In the following enumeration we shall quote the names THUNBERG wrote with the specimens and the brief statement about origin and collector on the back of the sheets (if recorded). In addition to this we shall give the authority (in most cases THUNBERG himself) with an abbreviated bibliographical reference, chiefly the work in which the species has been originally published, further the valid name if the original one has not been retained, in some cases the names written on the sheets by some botanists who examined the herbarium, if they differ from the valid ones, and finally the name(s) of the botanist(s) who has (have) done the revising.

[209] *Vide* : N. E. BROWN, A.L.S., " The South African Iridaceae of Thunberg's Herbarium," in Linnean Society's Journal.—Botany, Vol xlviii, April, 1928, p. 16

Since we paid only a 9-days visit to Uppsala, and had to divide our time between the then Botanical Institute and the R. University Library, it will be easily understood that we had to confine ourselves to examining some special groups of plants.

Special attention was accordingly paid *inter alia* to the Proteaceae, insectivorous plants, Stapelieae, Euphorbias, Cape bulbs, Aloes. With the aid of the *Index Generum* of WAHLENBERG's catalogue we selected the Cape genera and other genera of plants which are represented at the Cape by a fair number of species.

The *Index Generum* which is alphabetically arranged, is headed by the gen. *Adansonia*, L. (Bombacaceae). In the THUNBERG Herbarium we find the "Baobab," *Adansonia digitata*, L., represented by a few leaves, without any statement as to their origin. Since the *Adansonia* is a native of tropical Africa, where it is widely spread, and does not occur farther South than S. Rhodesia and the northern districts of the Transvaal (*inter alia* in the Kruger National Park), THUNBERG who was never nearer than about 400 miles from that region, cannot have gathered those leaves himself, and it is a problem who sent them to him. Curiously enough, JUEL does not record the Baobab leaves in his "Plantae Thunbergianae."

In 1937 we found the herbarium in an excellent condition and it was really a wonderful experience to see the specimens collected by THUNBERG himself, by FRANCIS MASSON and others over 160 years ago! In several cases the colour of the flowers is still preserved.

Several outstanding botanists have worked on the THUNBERG Herbarium, of whom may be mentioned here—as far as the Cape specimens are concerned—the late Dr. N. E. BROWN, the late Dr. S. SCHÖNLAND, Dr. E. P. PHILLIPS, Dr. J. HUTCHINSON, Dr. R. A. DYER, and the earlier investigators J. G. BAKER and F. W. KLATT.

A CAPE SELECTION OF THE THUNBERG HERBARIUM AT UPPSALA.

PROTEACEAE.

We deliberately start with this family of plants since its South African representatives which are very numerous, may be ranked among the most outstanding botanical features of this southernmost part of Africa, the *Protea* even being considered as South Africa's national flower. For the non-S. African reader it may be mentioned here that a flower of a species of *Protea* has been depicted on stamps and on small silver coins (sixpence and threepence).

It is rather curious that of this vast and varied family of Proteaceae THUNBERG seems to recognize two genera only, viz. *Protea*, L. and *Brabeium*, L., for when examining his herbarium we find that the genus *Protea* also compriscs those species which have been later on definitely ranged among the genera *Leucadendron*, Herm.,

Leucospermum, R. Br., *Mimetes*, Salisb., *Aulax*, Berg., *Serruria*, Salisb., *Diastella*, Knight, *Spatalla*, Salisb., *Spatallopsis*, Phillips, and some Australian genera, most of them having been already founded by contemporary botanists.

Protea, L.

1. P. acaulis, Thunb. Diss. Prot., p. 40 (1781).—Two sheets.—"Cap. Thunberg."
   α = *P. glaucophylla*, Salisb.—PHILLIPS det.
   β. nova=idem.—PHILLIPS det. (JUEL in his "Plantae Thunbergianae" retained the Thunbergian name P. acaulis for both specimens).
2. P. alba, Thunb. Diss. Prot., p. 31 (1781).—One sheet.
   This is, according to PHILLIPS, *Leucadendron aurantiacum*, Buek.
3. P. apifolia (authority ?).—One sheet.
   This is *Isopogon anemonifolius*, Knight, an Australian species, presumably sent by ROBERT BROWN from Nova-Hollandia.—J. HUTCHINSON det.
4. P. argentea, L.; Thunb. Diss. Prot., p. 40 (1781).—Two sheets.—"Cap. Thunberg."
   α and β=*Leucadendron argenteum*, (L.) R. Br., the Silvertree.—PHILLIPS det.
5. P. aulacea, Thunb. Diss. Prot., p. 31, tab. II (1781).—One sheet.—"Cap. Thunberg."
   This is *Aulax cneorifolia*, Knight.—O. STAPF det.
6. P. bracteata, Thunb. Diss. Prot., p. 27, tab. I (1781).—One sheet.—"Cap. Thunberg."
   Three branches of which 1 and 2 belong to *Aulax pinifolia*, Berg. and 3 to *A. pallasia*, Stapf.—O. STAPF det.
7. P. caudata, Thunb. Diss. Prot., p. 26, tab. II (1781)—Two sheets.
   α=*Spatallopsis caudata*, (Thunb.) Phillips.—J. HUTCHINSON det.—"Cap. Masson."
   β=idem.—J. HUTCHINSON det.—"Cap. Thunberg."
8. P. cinerea (authority ?)=(culta.)—cf. *Leucadendron cinereum*, R. Br.—J. HUTCHINSON det.—See also Protea verticillata, Thunb.!
9. P. coarctata, Thunb. Mém. Pétersb., p. 547, tab. XV (1818).—One sheet.
   This is, according to J. HUTCHINSON, *Petrophila pulchella*, R. Br., an Australian species. However, we find stated by THUNBERG on the back of the sheet: "Cap. b. Spei. Masson," so there must have been some confusion when mounting the specimens on the paper.
10. P. comosa, Thunb. Diss. Prot., p. 28 (1781).—Two sheets.
    α=*Leucadendron platyspermum*, R. Br.—PHILLIPS det.—"Cap. Thunberg."
    β=*Leucadendron aemulum*, R. Br.—PHILLIPS det.—"Cap. Masson"!
11. P. conifera, Thunb. Diss. Prot., p. 37 (1781); non L.—Five sheets.—"Cap. Thunberg."
    P. conif.=*Leucadendron uliginosum*, R. Br.—PHILLIPS det.
    α and β=*L. adscendens*, R. Br.—PHILLIPS det.
    γ=*L. strictum*, R. Br.—PHILLIPS det.
    δ=*L. adscendens*, R. Br.—PHILLIPS det.
12. P. conocarpa, Thunb. Diss. Prot., p. 22 (1781).—Two sheets.—"Cap. Thunberg."
    α (two branches)=*Leucospermum ellipticum*, R. Br. (non L. conocarpum,

(Thunb.) R. Br. !).—O. Stapf det.

β=idem.—O. Stapf det.

13. *P. cordata*, Thunb. Diss. Prot., p. 45, tab. V (1781).—One sheet.
Very broad, nearly cordate leaves.

14. P. corymbosa, (Berg.) Thunb. Diss. Prot., p. 29, tab. II (1781).—One sheet.—"Cap. Thunberg."
♂ and ♀ specimens=*Leucadendron corymbosum*, Berg.—Phillips det.

15. P. crinita, Thunb. Diss. Prot., p. 21 (1781).—One sheet.—"Cap. Thunberg.'
This is *Leucospermum crinitum*, (Thunb.) R. Br.—O. Stapf det.

16. P. cucullata, L.; Thunb. Diss. Prot., p. 23 (1781).—Two sheets.—"Cap. Thunberg."
α and β=*Mimetes lyrigera*, Knight.—Phillips det.

17. P. cyanoides, Thunb. Diss. Prot., p. 15 (1781); non L.—One sheet.—"Cap. Thunberg."
This is *Serruria diffusa*, R. Br.—Phillips det.

18. *P. cynaroides*, L.; Thunb. Diss. Prot., p. 44 (1781).—One sheet.
We find the marvellous "King Protea," the largest flowered species represented by a flower-head and the leaved top end of a branch (*vide* Plate VI.). Thunberg has written on the back of the sheet: "e Cap. b. spei Thunb."

19. P. daphnoides, Thunb. N. A. Petrop., p. 465, tab. VI: 2 (1806).—One sheet.—"Cap. Thunberg."
This is *Leucadendron daphnoides*, (Thunb.) Meissn.—Phillips det.

20. P. decumbens, Thunb. Diss. Prot., p. 14, tab. I (1781).—One sheet, containing two specimens.—"Cap. Thunberg."
α=*Serruria hyemalis*, Knight.—Phillips det. November 15, 1910.

21. P. divaricata, L.; Thunb. Diss. Prot., p. 44 (1781).—Two sheets.—"Cap. Thunberg."
Two specimens (with very small leaves), both belonging to *Diastella serpyllifolia*, Knight.—J. Hutchinson det.

22. P. elliptica, Thunb. Diss. Prot., p. 22 (1781).—One sheet.—"Cap. Thunberg."
This is *Leucospermum attenuatum*, R. Br.—Phillips et Stapf det.

23. P. erecta, Thunb. N. A. Petrop., p. 459 (1806).—One sheet.
This specimen has been identified by J. Hutchinson as belonging to the Australian Proteacea *Isopogon*, viz. *I. anethifolius*, Knight. On the back of the sheet we find recorded: "Nov. Holl."—Presumably sent to Thunberg by Robert Brown.

24. P. florida, Thunb. Diss. Prot., p. 15, tab. I (1781).—One sheet.—"Cap. Thunberg."
This is *Serruria florida*, (Thunb.) Knight, the "Blushing Bride."—Phillips det.
This species whose flowers are of extreme beauty and elegance, belongs to the botanical gems of the Frenchhoek mountains, where it is very scarce now.

25. *P. glabra*, Thunb. Diss. Prot., p. 42 (1781).—One sheet.—"Cap. Thunberg."

26. P. glomerata, Thunb. Diss. Prot., p. 18 (1781); non L.—One sheet.—"Cap. Thunberg."
This is *Serruria elongata*, (Berg.) R. Br.—Phillips det.

27. *P. grandiflora*, Thunb. Diss. Prot., p. 41 (1781).—One sheet.—"Cap. Thunberg."

The " Wagenboom " or " Wa'boom."

28. P. heterophylla, Thunb. Diss. Prot., p. 24 (1781).—Three sheets, α, β and β.—" Cap. Thunberg."

α=*Leucospermum puberum*, R. Br. var. *patulum*.—O. Stapf det.

β=*L. prostratum*, Stapf.—O. Stapf det.

β=*L. hypophyllum*, R. Br.—Phillips et Stapf det.

29. P. hirsuta, Thunb. Hoffm. Phyt. Blätt., p. 12 (1803).—One sheet.

This is *Leucadendron Levisanus*, Berg.—Phillips det. But named by Juel in his " Plantae Thunbergianae " : Leucadendron hirsutum, (Thunb.) Meissn.—On the back of the sheet we find recorded : " cult. in Horto Berolinensi. Hagen."

30. P. hirta, L. ; Thunb. Diss. Prot., p. 43 (1781).—One sheet.

This is *Mimetes hirta*, (L.) Knight—Phillips det.

31. P. hypophylla, Thunb. Diss. Prot., p. 23 (1781).—Three sheets, β without record of origin.—" Cap. Thunberg."

α=*Leucospermum hypophyllum*, (Thunb.) R. Br.—Phillips et Stapf det.

β=*L. tomentosum*, R. Br.—O. Stapf det.

γ=*L. hypophyllum*, (Thunb.) R. Br.—Phillips et Stapf det.

32. P. imbricata, Thunb. Diss. Prot., p. 38, tab. V (1781).—One sheet.

This is *Sorocephalus imbricatus*, (Thunb. vel L.f.) R. Br.—J. Hutchinson det.

33. P. incurva, Thunb. Diss. Prot., p. 26, tab. III (1781).—One sheet.—"Cap. Thunberg."

This is *Spatalla procera*, Knight.—Phillips det.

34. P. laevis, Thunb. Mém. Pétersb., p. 548, tab. XVI (1818).—One sheet.—" Cap. Thunberg."

This is *Leucadendron imbricatum*, R. Br.—Phillips det.

35. P. lanata, Thunb. Diss. Prot., p. 30, tab. III (1781).—One sheet.

This is *Sorocephalus lanatus*, (Thunb.) R. Br.—J. Hutchinson det.

36. P. Levisanus, (Berg.) Thunb. Diss. Prot., p. 37 (1781).—Three sheets.—" Cap. Thunberg."

α, β=*Leucadendron Levisanus*, Berg.—Phillips det.

γ (nova)=*L. truncatum*, Meissn.—Phillips det.

37. P. linearis, Thunb. Diss. Prot., p. 33, tab. VI (1781).—One sheet.—"Cap. Thunberg."

This is *Leucospermum lineare*, (Thunb.) R. Br.—Phillips det.

38. P. macrocephala, Thunb. Hoffm. Phyt. Blätt., p. 13 (1803).—One sheet.—" Cap. Thunberg."

This is *P. incompta*, R. Br.—Phillips det.—Juel in his " Plantae Thunbergianae " retained the name P. macrocephala for this specimen.

39. *P. marginata*, Thunb. Hoffm. Phyt., Blätt. p. 15 (1803).—One sheet.—" Cap. Thunberg."

40. *P. mellifera*, Thunb. Diss. Prot., p. 34 (1781).—One sheet, with 2 big flower-heads. The " Suikerbos " !

41. P. myrtifolia, Thunb. Diss. Prot., p. 41 (1781).—One sheet.

This is *Diastella myrtifolia*, (Thunb.) Knight.—J. Hutchinson det.

42. P. nana, (Berg.) Thunb. Diss. Prot., p. 30 (1781).—One sheet.—" Cap. Thunberg."

This is *P. rosacea*, L., the "Skaamblom," with its drooping red flower-heads.—PHILLIPS det.

43. P. nitens, Thunb. Fl. Cap., p. 314 (1813).—One sheet, containing two flower-heads.—"Cap. Thunberg."

This is probably *Mimetes saxatilis*, Phillips.—PHILLIPS det.—JUEL in his "Plantae Thunbergianae" named this species Mimetes nitens, (Thunb.) R. et Sch.

44. P. obliqua, Thunb. Diss. Prot., p. 35 (1781).—One sheet.—"Cap. Thunberg."

This is *Leucadendron plumosum*, R. Br.—PHILLIPS det.—JUEL in his "Plantae Thunbergianae" named this specimen P. parviflora, L.

45. P. obtusa, Thunb. = P. obtusata, Thunb. Hoffm. Phyt. Blätt., p. 15 (1803).—One sheet.—"Cap. Thunberg."

This is *Leucospermum obtusatum*, (Thunb.) Phill.—PHILLIPS det.

46. *P. odorata*, Thunb. Prodr., p. 187 (1800).—One sheet.—"Cap. Masson"!

47. P. ovata, Thunb. Mém. Pétersb., p. 548, tab. XVII (1818).—One sheet.—"Cap. Sparrman"!

This is *P. longiflora*, Lam.—PHILLIPS det.

48. P. pallens, Thunb. Diss. Prot., p. 36 (1781); non L.—Three sheets.—"Cap. Thunberg."

α and β = *Leucadendron adscendens*, R. Br.—PHILLIPS det.

γ = *L. adscendens*, R. Br. var. *pallens*, Phillips et Hutchinson.—PHILLIPS det.

49. P. parviflora, L.; Thunb. Diss. Prot., p. 35, tab. IV (1781).—One sheet.—"Cap. Thunberg."

This is *Leucadendron plumosum*, R. Br.—PHILLIPS det.

50. P. patula, Thunb. Diss. Prot., p. 16 (1781).—Two sheets.—"Cap. Thunberg."

α and β = *Serruria decipiens*, R. Br.—J. HUTCHINSON det.

51. P. phylicoides, (Berg.) Thunb. Diss. Prot., p. 19 (1781).—Four sheets.—"Cap. Thunberg."

α and β = *Serruria hirsuta*, (Poir.) R. Br.—J. HUTCHINSON det.

γ = *Serruria vallaris*, Knight.—J. HUTCHINSON det.

P. phyl. ("dissecta") = *S. vallaris*, Knight.—J. HUTCHINSON det.

52. P. pinifolia, L.; Thunb. Diss. Prot., p. 25 (1781).—One sheet.—"Cap. Thunberg."

This is *Aulax pinifolia*, Berg.—O. STAPF det.

53. P. plumigera, Thunb. Mém. Pétersb., p. 547, tab. XIV (1818).—One sheet.—"Cap. Masson"!

This is *Serruria simplicifolia*, (Poir.) R. Br.—PHILLIPS det.

54. P. prolifera, Thunb. Diss. Prot., p. 29, tab. IV (1781).—One sheet.—"Cap. Thunberg."

This is *Spatalla prolifera*, (Thunb.) Knight.—PHILLIPS et HUTCHINSON det.

55. P. prostrata, Thunb. Prodr., p. 27 (1794).—One sheet.—"Cap. Thunberg."

This is *Leucospermum prostratum*, (Thunb.) Stapf.—O. STAPF det. (see also under No. 28).

56. P. pubera, L.; Thunb. Diss. Prot., p. 42 (1781).—Four sheets.

α, β and γ = *Leucospermum puberum*, (L.) R. Br.—PHILLIPS det.

δ = *Diastella breviflora*, Knight.—PHILLIPS det.—"Cap. Thunberg."

57. P. purpurea, L.; Thunb. Diss. Prot., p. 28 (1781).—One sheet.—"Cap. Thunberg."

This is *Diastella ericaefolia*, Knight.—J. HUTCHINSON det.

58. P. pyramidalis, Thunb. Hoffm. Phyt. Blätt., p. 11 (1803).—One sheet.—"Cap. Thunberg."
    This is *Leucadendron decurrens*, R. Br.—PHILLIPS det.
59. P. racemosa, Thunb. Diss. Prot., p. 25 (1781); non L.—One sheet.—"Cap. Thunberg."
    This is *Spatalla gracilis*, Knight.—PHILLIPS et HUTCHINSON det.
60. *P. repens*, Thunb. Diss. Prot., p. 34 (1781).—One sheet.
    Two branches; the left-hand specimen belongs to *P. repens*, Thunb., the right-hand specimen to *P. acaulis*, Thunb. var. *angustifolia*, Phillips.—PHILLIPS det.
61. P. reticulata, Thunb. Hoffm. Phyt. Blätt., p. 13 (1803).—One sheet.—"Cap. Thunberg."
    This is *P. grandiflora*, Thunb. var. *angustifolia*, Ker.—PHILLIPS det.
62. P. rugosa, Thunb. Hoffm. Phyt. Blätt., p. 11 (1803).—One sheet.—"Cap. Thunberg."
    This is *Leucadendron grandiflorum*, R. Br.—PHILLIPS det.
63. P. saligna, Thunb. Diss. Prot., p. 39 (1781); non L.—One sheet.—"Cap. Thunberg."
    This is *Leucadendron uliginosum*, R. Br.—PHILLIPS det. (see also under No. 11).
64. P. scabrida, Thunb. Hoffm. Phyt. Blätt., p. 14 (1803).—One sheet.—"Cap. Thunberg."
    This is *P. lepidocarpodendron*, L.—PHILLIPS det.
65. P. scolymus, Thunb. Diss. Prot., p. 33 (1781).—One sheet.—"Cap. Thunberg."
    This is *P. scolymocephala*, (L.) Reich.—Identified by?
66. P. sericea, Thunb. Diss. Prot., p. 39 (1781).—One sheet.
    This is *Leucadendron sericeum*, (Thunb.) R. Br.—PHILLIPS det.
67. P. serraria, L.; Thunb. Diss. Prot., p. 17 (1781).—Six sheets, all but one "Cap. Thunberg."
    α and δ=*Serruria Knightii*, Hutchinson—J. HUTCHINSON det.
    β=*S. Burmanni*, R. Br.—J. HUTCHINSON det.
    γ and ϵ=*S. subsericea*, Hutchinson.—J. HUTCHINSON det.
    ς (two specimens): the left-hand specimen belongs to *S. ciliata*, R. Br., the right-hand specimen is *S. decipiens*, R. Br.—J. HUTCHINSON det.—"Cap. Masson"!
68. *P. speciosa*, L.; Thunb. Diss. Prot., p. 42 (1781).—One sheet.—"Cap. Thunberg."
69. P. sphaerocephala, Thunb. Diss. Prot., p. 16 (1781).—One sheet.—"Cap. Thunberg."
    This is *Serruria glomerata*, (L.) R. Br.—PHILLIPS det.
70. P. strobilina, Thunb. Prodr., p. 38 (1794); non L.—One sheet, containing two specimens.
    Left-hand specimen=*Lcucadendron spathulatum*, R. Br.—PHILLIPS det.
    Right-hand specimen=*L. ovale*, R. Br.—J. HUTCHINSON det.
71. P. tenuifolia, Houtt.: Thunb. Hoffm. Phyt. Blätt., p. 9 (1803).—(Originally named by HOUTTUYN).—One sheet.—"Cap. Thunberg."
    This is *Leucadendron brunioides*, R. Br.—PHILLIPS det.
72. P. tomentosa, Thunb. Diss. Prot., p. 24 (1781)—Two sheets.
    α=*Leucospermum candicans*, Loud.—O. STAPF det. But according to

Juel in his " Plantae Thunbergianae " this is L. tomentosum, (Thunb.) R. Br.—" Cap. Thunberg."

β=*L. tomentosum*, (Thunb.) R. Br.—Phillips det.

73. P. torta, Thunb. Diss. Prot., p. 31 (1781).—One sheet.
This is *Leucadendron brunioides*, Meissn. (non R. Br. !).—Phillips det.

74. P. totta, L. ; Thunb. Diss. Prot., p. 42 (1781).—One sheet.
This is *Leucospermum tottum*, (L.) R. Br.—Phillips det.

75. P. triternata, Thunb. Diss. Prot., p.18 (1781).—One sheet.—" Cap. Thunberg."
This is *Serruria anethifolia*, Knight.—J. Hutchinson det.

76. P. truncata, Thunb. N. A. Petrop., p. 462, tab. IV : 1 (1806).—One sheet.
This is *Leucadendron truncatum*, (Thunb.) Meissn.—Phillips det.

77. P. umbellata, Thunb. Diss. Prot., p. 31, tab. II (1781).—One sheet.
This is *Aulax cneorifolia*, Knight.—O. Stapf det.—It may be mentioned that the specimen on the sheet is marked : " Protea umbellata Aulax ♀." On the back of the sheet : " Cap. Thunberg."

78. P. venosa, Thunb. Hoffm. Phyt. Blätt., p. 10 (1803).—One sheet.—" Cap. Thunberg."
This is *Leucadendron decorum*, R. Br.—Phillips det.

79. P. verticillata, Thunb. Hoffm. Phyt. Blätt., p. 12 (1803).—Two sheets.—" Cap. Thunberg."
α and β=*Leucadendron cinereum*, R. Br.—Phillips det.

80. P. villosa, Thunb. Prodr., p. 187 (1800).—One sheet.—" Cap. Masson " !
This is *Serruria millefolia*, Knight.—J. Hutchinson det.

81. P. virgata, Thunb. Hoffm. Phyt. Blätt., p.11 (1803).—Two sheets.—" Cap. Thunberg."
α and β=*Leucadendron pubescens*, R. Br.—Phillips det.

82. Protea 196.—Sheet, containing a leaved branch and a flower-head of the Australian " Waratah,"
Telopea speciosissima, R. Br.—J. Hutchinson det.

From the above enumeration it is learned that the Proteas as represented in the Thunberg Herbarium include 16 species of *Protea*, 23 species of *Leucadendron*, 12 species of *Leucospermum*, 15 species of *Serruria*, 4 species of *Diastella*, 3 species of *Aulax*, 3 species of *Mimetes*, 3 species of *Spatalla*, 1 species of *Spatallopsis*, 2 species of *Sorocephalus*, while 4 specimens belong to species of the Australian genera *Isopogon* (2), *Petrophila* (1) and *Telopea* (1).

Proceeding to the genus *Brabeium*, L. (also spelled *Brabejum*), we find its only species, *B. stellatifolium*, L., the " Wild Almond," represented under the name B. stellatum (Thunb. Prodr., p. 31 (1794)). One sheet, marked on the back " Cap. Thunberg."

We may recall that the common name applied to this plant by Thunberg in his " Travels " is " Wild Chestnuts " or " Wilde Castanien "[210].

Droseraceae.

This group of insectivorous plants, as represented in the Thunberg Herbarium, numbers 11 species of *Drosera*, including 1 species of *Roridula*, of which 6 originate from the Cape, viz. :

[210] *Vide* Journ. of S. Afr. Botany, Vol. V, October 1939, Carl Peter Thunberg, etc. III, p. 114.

Drosera, L.

1. *D. acaulis*, L.f. Suppl., p. 188 ("Thunb.") (1781); Thunb. Prodr., p. 57 (1794); Diss. Dros., p. 5 (1797).—One sheet.—"Cap. Thunberg."

   A very dwarf species!

2. *D. capensis*, L.; Thunb. Prodr., p. 57 (1794); Diss. Dros., p. 6 (1797).—One sheet.—"Cap. Thunberg."

   The specimens of this fine Cape "Sundew" which grows *i.a.* on the slopes of Table Mountain, are well preserved and quite recognizable!

3. *D. cistiflora*, L.; Thunb. Prodr., p. 57 (1794); Diss. Dros., p. 6 (1797).—Two sheets, containing five plants.—"Cap. Thunberg."

   D. cistifl. α and β. A large-flowering species!

4. *D. cuneifolia*, L.f. Suppl., p. 188 ("Thunb.") (1781); Thunb. Prodr., p. 57 (1794); Diss. Dros., p. 5 (1797).—Four sheets.

   D. cuneifolia α, β and γ: "Cap. Thunberg"; idem δ: "Ceil. Thunberg" (?).

   A species with small rosettes of short leaves.

5. *D. ramentacea*, Burch.—One sheet.—"Cap. Masson"!

6. D. roridula, Thunb. Diss. Dros., p. 7 (1797).—One sheet.—"Cap. Thunberg."

   This is *Roridula dentata*, L.; Thunb. Prodr., p. 41 (1794).

   A most remarkable plant and quite distinct from the gen. *Drosera* by its non-motile tentacles. Later botanists separated the gen. *Roridula*, of which 2 species only are known, from the Droseraceae and either classified it with the Ochnaceae or considered it as representing a family by itself, the Roridulaceae.

   R. dentata is a more or less woody plant or shrub, known under the common name of "Fly-bush," which occurs in the Winterhoek Mountains and Cedarbergen and on the Cold Bokkeveld. The branches mounted on the sheet are very distinct by their woody character.

   The other species is *R. gorgonias*, Planch. which is also a native of the western districts of the Cape.

Note. It is rather curious that the small red Cape "Sundew," *Drosera pauciflora*, Banks (syn. D. trinervia, Spreng.), with rosettes of tiny round leaves with reddish tentacles, a species which is rather common in the Peninsula (we found some specimens in dry places in the thicket of plants and shrubs near the Herbarium at Kirstenbosch), is *not* represented in the THUNBERG Herbarium.

EUPHORBIACEAE.

The above family as represented in the THUNBERG Herbarium includes many Cape plants, of which the genera *Cluytia* (also spelled Clutia) and *Euphorbia*, the former restricted to South Africa only, the latter represented by a great number of species—many of succulent character—may be mentioned here.

Follows an enumeration of the Cape Euphorbias.

Euphorbia, L.

1. *E. armata*, Thunb. Prodr., p. 86 (1800).—One sheet.—"Cap. Thunberg."

   N. E. BROWN det.—This is not E. loricata, Lam. as named by JUEL in his "Plantae Thunbergianae."

2. E. canariensis, Thunb. Fl. japon., p. 196 (1794); non L. !—One sheet.—"Cap. Thunberg."
   This is *E. Ledienii*, Berger.—N. E. Brown det.
3. E. coronata, Thunb. Prodr., p. 86 (1800).—One sheet.—"Cap. Thunberg."
   This is *E. clava*, Jacq.—N. E. Brown det.
4. *E. elliptica*, Thunb. Prodr., p. 86 (1800).—One sheet.—"Cap. Thunberg."
   N. E. Brown det.
5. *E. fasciculata*, Thunb. Prodr., p. 86 (1800).—One sheet.—"Cap. Thunberg."
   N. E. Brown has written with the specimen: "E. fasciculata, Thunb. The flowers do not belong to the plant, but to some species allied to E.. mauritanica, L."
6. *E. genistoides*, Berg.; Thunb. Prodr., p. 86 (1800).—Two sheets, both marked "Cap. Thunberg."
7. *E. helioscopia*, L.; Thunb. Fl. japon., p. 197 (1794).—Two sheets.
   The first sheet is marked on the back: "Japon. Thunberg," the second sheet: "Cap. Thunberg." The specimen on the second sheet has been identified by N. E. Brown as *E. helioscopia*, L.
8. E. hyberna, Thunb. Mus. Upsal. XV, p. 123 (1794); non L. !—One sheet.—"Cap. Thunberg."
   According to Boissier this specimen belongs to *E. characias*, L.
9. *E. mammillaris*, L.; Thunb. Prodr., p. 86 (1800).—One sheet.
10. *E. mauritanica*, L.; Thunb. Prodr., p. 86 (1800).—One sheet.—"Cap Thunberg."
    Boissier et N. E. Brown det.
11. E. Medusae, Thunb. Prodr., p. 86 (1800).—Three sheets.—"Cap. Thunberg."
    α, β = *E. caput-medusae*, L.—N. E. Brown det.
    γ = *E. hamata*, Sweet (syn. E. cervicornis, Boiss.).—N. E. Brown det.
12. *E. muricata*, Thunb. Prodr., p. 86 (1800).—One sheet.—"Cap. Thunberg."
    N. E. Brown det.
13. E. obtusata, Thunb. herb. (non Pursh.!)—Four sheets.—"Cap. Thunberg."
    E. obt. 1 = *E. Kraussiana*, Bernh. (not the var. of erubescens).—N. E. Brown det.
    E. obt. 2 = *E. epicyparissias*, E. Mey. (syn. E. involucrata, E. Mey.).—N. E. Brown det.
    E. obt. 3, 4 = *E. epicyparissias*, E. Mey. On sheet 4 Thunberg has recorded: "e Cap. bonae spei in Lange Kloof."—N. E. Brown det.
14. *E. Peplus*, L.; Thunb. Fl. japon., p. 196 (1794).—One sheet.—"Cap. Thunberg."
    N. E. Brown det.
15. E. radiata, Thunb. Prodr., p. 86 (1800).—One sheet.—"Cap. Thunberg ad Swartkopsrivier."
    This is *E. stellata*, Willd.—Boissier et N. E. Brown det.
16. E. reflexa, Thunb. Mus. Upsal. auct., p. 12 (1827); non Spreng. !—One sheet.—"Cap. Thunberg."
    This is *E. pinea*, L. according to Boissier.
17. *E. striata*, Thunb. Prodr., p. 86 (1800).—One sheet.—"Cap. Thunberg."
    N. E. Brown det.
18. E. tirucalli, Thunb. Prodr., p. 86 (1800); non L. !—Four sheets.—"Cap. Thunberg."
    E. tirucalli 1: indeterminable, but *not* E. tirucalli, *L.* N. E. Brown !

E. tiruc. 2 (two specimens): A=*E. decussata*, E. Mey., B= *E. Mundii*, N. E. Br.—N. E. Brown det.

E. tiruc. 3 (two specimens): A=*E. Burmanni*, E. Mey., B=*E. arceuthobioides*, Boiss.—N. E. Brown det.

E. tiruc. 4=*E. mauritanica*, L.—N. E. Brown det.

19. *E. tuberosa*, L.; Thunb. Prodr., p. 86 (1800).—One sheet.—"Cap. Thunberg."

N. E. Brown det.

Asclepiadaceae.

Apart from many species from Ceylon and Java, the above family as represented in the Thunberg Herbarium includes a certain number of Cape plants belonging to different genera which have been revised by N. E. Brown, and of which the "Ceropegias" (=*Microloma*) and Stapelieae may be mentioned here.

Placed among the genus *Ceropegia*, L. we find two species, both belonging to the genus *Microloma*, R. Br.

1. C. sagittata, L.; Thunb. Prodr., p. 37 (1794).—One sheet.—"Cap. Thunberg."

This is *Microloma sagittatum*, (L.) R. Br.—N. E. Brown det.

2. C. tenuifolia, L.; Thunb. Prodr., p. 37 (1794).—One sheet.—"Cap. Thunberg."

This is *Microloma lineare*, R. Br. according to N. E. Brown, but Juel in his "Plantae Thunbergianae" retained the Linnean specific name by naming the plant M. tenuifolium, (L.) K. Schum.

Stapelia, L.

This genus as represented in the Thunberg Herbarium includes 1 species of *Brachystelma*, 4 (–5) species of *Stapelia*, 2 species of *Caralluma*, 1 species of *Trichocaulon* and a plant which has been separated from the genus *Stapelia* under the name *Diplocyatha ciliata*, (Thunb.) N. E. Br. (a monotypic genus).

1. S. caudata, Thunb. Prodr., p. 46 (1794).—One sheet.—"Cap. Thunberg."

This is *Brachystelma caudatum*, (Thunb.) N. E. Br.—N. E. Brown det. December, 1878!

2. S. ciliata, Thunb. Prodr., p. 46 (1794).—One sheet.—"Cap. Thunberg."

This is *Diplocyatha ciliata*, (Thunb.) N. E. Br.—N. E. Brown det.

3. S. hirsuta, L.; Thunb. Prodr., p. 46 (1794).—Two sheets.—"Cap. Thunberg."

α=according to N. E. Brown: *Stapelia* (§ Stapeltonia) *sp.* (non hirsuta, L.), Journ. Linn. Soc., Vol. XVII, tab. II f. 18-21.

β=*Stapelia* (§ Stapeltonia) *sp.* (non hirsuta L.) N. E. Brown in Journ. Linn. Soc., Vol. XVII, f. 22-23.

4. S. incarnata, L.f. Suppl., p. 171 ("Thunb.") (1781); Thunb. Prodr., p. 46 (1794).—One sheet.—"Cap. Thunberg." Some parts of the stem only.

This is *Caralluma incarnata*, (L.f.) N. E. Br.—N. E. Brown det.

5. S. mammillaris, L.; Thunb. Prodr., p. 46 (1794).—One sheet.—"Cap. Thunberg."

This is *Caralluma mammillaris*, (L.) N. E. Br.—N. E. Brown det.

6. S. pilifera, L.f. Suppl., p. 171 ("Thunb.") (1781); Thunb. Prodr., p. 46 (1794). One sheet.—"Cap. Thunberg." Two stems and two flowers separately glued on the paper.

   This is *Trichocaulon piliferum*, (L.f.) N. E. Br.—N. E. Brown det.

7. *S. planiflora*, Jacq. (§ Orbea).—Two sheets.—"e Cap., cult. in H. Upsal. Thunberg."

   1) Branchlet with flower; ring and corona very distinct.

   2) Burst fruit with seeds and cuts of the stem without flowers.

   All taken from specimens cultivated in the Botanic Garden at Uppsala.

   1) and 2) really belonging to *S. planiflora*, Jacq.—N. E. Brown det.

8. *S. variegata*, L.; Thunb. Prodr., p. 46 (1794).—One sheet.—"Cap. Thunberg." Parts of the stem; stem with flower (damaged); separate flower.—*S. variegata*, L.! N. E. Brown det.

9. *S. fasciculata*, Thunb. Prodr., p. 46 (1794).—One sheet.—"Stapelia—Cap. Thunberg." Part of the stem without flowers, but with bursting fruits with the tufts of long silky hairs protruding.

   Probably *S. fasciculata*, Thunb. according to N. E. Brown.

Amaryllidaceae.

Of this group of bulbous plants we examined the genus **Hypoxis**, L.

The species of *Hypoxis* as represented in the Thunberg Herbarium apparently have been revised by some botanist (perhaps a S. African) whose name has not been written on the sheets, after Juel's "Plantae Thunbergianae" has been published, the new names having not been included in the book.

1. H. alba, (Thunb.) L.f. Suppl., p. 198 ("Thunb.") (1781); Thunb. Prodr., p. 60 (1794); syn. Fabricia alba, Thunb. in Fabricius' Reise, p. 26 (1779).—Four sheets.—"Cap. Thunberg."

   All specimens belong to *Janthe aquatica*, (L.f.) Williams.—Revised by ?—Juel retained the Linnean name H. alba.

2. H. decumbens, Lam. (non L.)=*H. villosa*, (Thunb.) L.f. (see below under No. 8).

3. H. minuta, (Thunb.) L.f. 1781; Thunb. Prodr., p. 59 (1794); syn. Fabricia minuta, Thunb. in Fabricius' Reise, p. 25 (1779).—One sheet.—"Cap. Thunberg."

   This species, the smallest of all, has been separated from this genus and included in the gen. *Janthe* under the name *J. minuta*, (Thunb.) Williams.—Revised by ?—Juel retained the Linnean name H. minuta.

4. H. ovata, L.f. Suppl., p. 197 ("Thunb.") (1781); Thunb. Prodr., p. 60 (1794).—Three sheets, α, β and γ.—"Cap. Thunberg." On sheet γ marked "nova."

   Juel retained the Linnean name H. ovata, but it has been renamed *Janthe ovata*, (L.f.) Salisb. by ?

5. H. plicata, (Thunb.) L.f. Suppl., p. 197 ("Thunb.") (1781); Thunb. Prodr., p. 60 (1794); syn. Fabricia plicata, Thunb. in Fabricius' Reise, p. 29 (1779); Curculigo plicata, (Thunb.) Ait.

   Juel retained the latter name, Curculigo plicata (non Dryander!), but this species has been renamed *Forbesia plicata*, (Thunb.) Nel. Revised by ?

6. H. serrata, (Thunb.) L.f. Suppl., p. 197 ("Thunb.") (1781); Thunb. Prodr., p. 60 (1794); syn. Fabricia serrata, Thunb. in Fabricius' Reise, p. 29 (1779). —Two sheets, α (type) and β.—"Cap. Thunberg."

   This is *Janthe serrata*, (Thunb.) Salisb. Revised by ?—JUEL in his book retained the Linnean name H. serrata.

7. H. stellata, (Thunb.) L.f. Suppl., p. 197 ("Thunb.") (1781); Thunb. Prodr., p. 60 (1794); syn. Fabricia stellata, Thunb. in Fabricius' Reise, p. 27 (1779).—Three sheets.—"Cap. Thunberg."

   Sheet α (type), labelled "Fabricia stellata" by THUNBERG.

   This is *Janthe stellata*, (Thunb.) Williams.—Named by ?

8. *H. villosa*, (Thunb.) L.f. 1781; Thunb. Prodr., p. 60 (1794); syn. Fabricia villosa, Thunb. in Fabricius' Reise, p. 31 (1779); Hypoxis decumbens, Lam. (non L. !).—Six sheets.—"Cap. Thunberg."

   H. v. α. stalks and leaves very hairy, feltlike.

   H. v. β, less hairy.

   H. v. γ, of different habit, long and slender; labelled by THUNBERG: "Hypoxis villosa γ. an diversa nova ?"

   H. v. δ, labelled by THUNBERG: "Hypoxis villosa δ. nov. ?"

   H. decumbens, two sheets from the Cape, β and γ.

   All belonging to *H. villosa*, (Thunb.) L.f.—Determined by ?

IRIDACEAE.

The South African Iridaceae of the THUNBERG Herbarium have been described and revised by the late Dr. N. E. BROWN, A. L. S. in Journal of the Linnean Society. —Botany, Vol. xlviii, April, 1928. This is a very useful paper which ought to be consulted by any systematist who works in the S.A. Iridaceae.

When examining the Herbarium Thunbergianum, we picked out the Gladioli and Ixiae of which a complete survey may be given here.

Gladiolus, L.

This numerous S. African genus as represented in THUNBERG's Herbarium includes species of *Micranthus*, *Galaxia*, *Synnotia*, *Lapeyrousia* (many !), *Tritonia*, *Babiana*, *Hesperantha*, *Watsonia* (many !), *Acidanthera*, *Antholyza*, *Ixia*, *Freesia*, *Romulea*, *Melasphaerula*.

1. *G. alatus*, L.; Thunb. Diss. Glad., p. 16 (1784).—One sheet.—"Cap. Thunberg."

   N. E. BROWN has retained the name *G. alatus*, L. (1760).

2. G. alopecuroides, L.; Thunb. Diss. Glad., p. 15 (1784).—Three sheets, α, β and the third one not lettered.—"Cap. Thunberg."

   α=*Micranthus alopecuroides*, (L.) Eckl. and matches the type of G. alopecuroides, L. (1756); it is not M. plantagineus, Eckl. as named by KLATT.

   β=*Micranthus plantagineus*, (L.) Eckl., not M. fistulosus, Eckl. as named by KLATT.

   The third sheet contains leaves only, which belong to *Micranthus fistulosus*, Eckl.

N. E. Brown does not agree with Juel, who claims that all three belong to M. plantagineus, (L.) Eckl.

3. G. anceps, L.f. ; Thunb. Diss. Glad., p. 17, tab. 2 (1784).—One sheet.—" Cap. Thunberg."

   This is *Lapeyrousia anceps*, (L.f.) Baker, Handb. Irid., p. 172 (1892), not of Ker !

4. G. angustus, L. ; Thunb. (" augustus ") Diss. Glad., p. 19 (1784).—One sheet.—" Cap. Thunberg."

   N. E. Brown : This is *G. vinulus*, Klatt=MacOwan, Herb. Norm. 287 ! Not G. fasciatus, Roem. et Sch.=G. angustus, Klatt non Thunb.

5. G. bicolor, Thunb. Diss. Glad., p. 16, tab. 2 (1784).—Two sheets.—" Cap. Thunberg."

   Both sheets contain specimens of *Synnotia bicolor*, (Thunb.) Sweet. (according to Juel and N. E. Brown).

6. G. bracteatus, Thunb. Prodr., p. 186 (1800), and in Nat. Selsk. Köbenh., p. 12, tab. III (1810).—Two sheets.—" Cap. Thunberg."

   Both are *Lapeyrousia fissifolia*, (Jacq.) Ker (according to Juel and N. E. Brown).

7. *G. brevifolius*, Jacq. ; Thunb. Nat. Selsk. Köbenh., p. 3 (1810) ; G. tristis i. aphyllus et k. ruber Thunb. Diss. Glad., p. 12 (1784).—Two sheets. On the back of sheet *a* is written : " e Cap. bonae spei. *prope urbem*. Thunberg."

   Both appear to be *G. brevifolius*, Jacq. as named by Thunberg. Identified by Juel and N. E. Brown.

8. G. bullatus, Thunb. MS in Herb. (not in Diss. Glad., p. 12 (1784), as quoted by Juel).—One sheet.—" Cap. Thunberg."

   According to N. E. Brown and Mrs. L. Bolus this is *G. spathaceus*, Pappe and not G. inflatus, Thunb. as named by Klatt and quoted by Juel.

9. G. communis, Thunb. Diss. Glad., p. 13 (1784).—One sheet marked *β*. This is *G. segetum*, Ker, and the locality " e Cap. b. spei " is probably wrong (N. E. Brown).

10. *G. cordatus*, Thunb. Prodr., p. 185 (1800).—One sheet.—" Cap. Thunberg."

    This is not G. angustus, L. as named by Klatt and Baker and quoted by Juel.

11. G. crispus, L.f. ; Thunb. Diss. Glad., p. 10, tab. 1 (1784).—One sheet.—" Cap. Thunberg."

    This is *Tritonia crispa*, (L.f.) Ker, which agrees with the type of G. crispus, L.f. (1781).

    The edges of the leaves are crisped and waved.

12. G. dichotomus, Thunb. Diss. Glad., p. 10 (1784).—One sheet.—" Cap. Thunberg."

    This is not G. permeabilis, De la Roche, as Baker states, but *Romulea dichotoma*, (Thunb.) Baker. It is named by Juel G. permeabilis, *Burm.*

13. *G. elongatus*, Thunb. Prodr., p. 185 (1800).—One sheet.—" Cap. Thunberg."

    N. E. Brown has reason to retain the Thunbergian name *G. elongatus*. It is not all like G. gracilis, Jacq., under which Baker has placed it and which has been retained by Juel, nor like G. strictus, Jacq., as Klatt has named it on the sheet.

14. *G. equitans*, Thunb. Prodr., p. 186 (1800). and in Nat. Selsk. Köbenh., p. 11, tab. 2 (1810).—One sheet.—" Cap. Thunberg."

    A broad-leaved, large-flowering species. N. E. Brown has retained the

Thunbergian name *equitans* (syn. G. namaquensis, Ker). It is perfectly distinct from G. alatus, L. as KLATT has named it on the sheet, nor is it a variety of that species as quoted by JUEL, viz. G. alatus, L. var. namaquensis, Ker.

15. G. exscapus, Thunb. Prodr., p. 184 (1800), and in Nat. Selsk. Köbenh., p. 3, tab. 1 (1810).—Two sheets.—"Cap. Thunberg."

This is *Acidanthera exscapa*, (Thunb.) Baker (1876), not A. tubulosa, (Houtt.) Baker, as quoted by JUEL, which was founded upon Ixia tubulosa, Houttuyn, "Handleiding," XII, p. 36, tab. 78, fig. 2, whose flowers are different from those of A. exscapa.

16. G. Fabricii, Thunb. Prodr., p. 186 (1800).—One sheet.—"Cap. Thunberg."

This is *Lapeyrousia Fabricii*, (Thunb.) Ker.

17. G. falcatus, L.f. Suppl., p. 96 ("Thunb.") (1781); Thunb. Diss. Glad., p. 10, tab. 1 (1784).—One sheet.—"Cap. Thunberg."

This is *Lapeyrousia falcata*, (L.f.) Ker in KÖNIG and SIMS, Ann. Bot. i, p. 238 (1804). Not Hesperantha falcata, Ker as named by KLATT on the sheet.

18. G. flexuosus, L.f. Suppl., p. 96 ("Thunb.") (1781); Thunb. Diss. Glad., p. 9, tab. 1 (1784).—One sheet.—"Cap. Thunberg."

According to N. E. BROWN this specimen is identical with the type of G. flexuosus, L.f. and equals *Acidanthera flexuosa*, (L.f.) Baker, as JUEL has named it. But as the perianth is irregular, it may be wondered why it is no true Gladiolus.

19. G. glumaceus, Thunb. Prodr., p. 186 (1800).—One sheet.—"Cap. Thunberg."

This species equals *Watsonia marginata*, (L.f.) Ker, according to BAKER and JUEL in his "Plantae Thunbergianae," but is not W. iridifolia, Sweet, as named by KLATT on the sheet.

20. *G. gracilis*, Jacq.; Thunb. Prodr., p. 185 (1800).—One sheet.—"Cap. Thunberg."

Like JUEL, N. E. BROWN retains the name *G. gracilis*, Jacq. (1790).

21. G. gramineus, L.f.; Thunb. Diss. Glad., p. 22 (1784).—Two sheets.—"Cap. Thunberg."

Both *Melasphaerula graminea*, (L.f.) Ker.

22. *G. grandis*, Thunb. Prodr., p. 185 (1800).—One sheet.—"Cap. Thunberg."

The type of the spec. *G. grandis*, Thunb.

23. *G. hastatus*, Thunb. Prodr., p. 185 (1800).—One sheet.—"Cap. Thunberg."

According to N. E. BROWN this specimen is the type of *G. hastatus*, Thunb.; it is much like G. inflatus, Thunb. (not of Baker !), but differs in having the lower middle segment marked with a hastate (yellow ?) spot outlined with dark red or purple.

24. *G. inflatus*, Thunb. Prodr., p. 185 (1800).—Two sheets.—"Cap. Thunberg."

N. E. BROWN retained the name *G. inflatus*, Thunb. [syn. G. Bolusii, Baker (1892)].

25. G. ixioides, Thunb. Fl. Cap., p. 208 (1811).—One sheet.—"Cap. Thunberg."

This is *Ixia paniculata*, De la Roche, not Tritonia longiflora, Ker, as named by KLATT on the sheet.

26. G. junceus, L.f. Suppl., p. 96 ("Thunb.") (1781); Thunb. Diss. Glad., p. 18 (1784).—One sheet.—"Cap. Thunberg."

This is *Lapeyrousia juncea*, (L.f.) Pourr., not Anomatheca juncea, Ker, as named by KLATT.

27. *G. laccatus*, Thunb. Prodr., p. 186 (1800).—One sheet.—"Cap. Thunberg."

N. E. Brown identified this specimen as the type of *G. laccatus*, Thunb. [syn. G. villosus, Ker (1827)]. It is not G. pilosus, Eckl., as named by Klatt on the sheet.

28. G. laevis, Thunb. Prodr., p. 184 (1800).—One sheet.—" Cap. Thunberg."

This is *G. tenellus*, Jacq., and not G. gracilis, Jacq. under which name Baker places it. According to N. E. Brown, Juel and Klatt.

29. G. laxus, Thunb. Fl. Cap. ed. Schultes, p. 50 (1823).—One sheet.—" Cap. Thunberg."

This is *Lapeyrousia laxa*, (Thunb.) N. E. Br. comb. nov. Other synonyms are : Meristostigma laxum, A. Dietr. (1833); Anomatheca cruenta, Lindl. (1830); Lapeyrousia cruenta, (Lindl.) Baker (1892). It is not Tritonia longiflora, as named by Klatt on the sheet.

30. G. longiflorus, L.f. Suppl., p. 96 (" Thunb.") (1781); Thunb. Diss. Glad., p. 19 (1784).—Two sheets.—" Cap. Thunberg."

Both are the same plant and equal G. longiflorus, L.f., but since Thunberg's specimens of this species belong to the genus *Tritonia*, and, as Tritonia longiflora, Ker belongs to the genus *Ixia*, N. E. Brown writes that there is no reason why the Linnean and Thunbergian specific name should not be conserved under *Tritonia*, and he therefore proposes the name *Tritonia longiflora*, (L.f.) N. E. Br. comb. nov.

It is not Ixia paniculata, Delar., as proposed by Juel, nor Montbretia striata, Baker, as written on the sheets by Baker, which name is a synonym of Tritonia Bakeri, Klatt.

31. G. marginatus, L.f.; Thunb. Diss., Glad., p. 18 (1784).—Five sheets, each containing a different species.—" Cap. Thunberg."

α = *Watsonia Schlechteri*, L. Bolus (not W. Pillansii, L. Bolus as proposed by Mrs. Bolus, nor W. roseo-alba, Gawl, as written on the sheet by Klatt).

β = *Watsonia Ardernei*, Sander (not W. marginata, Gawl, as named by Klatt on the sheet).

γ = *Watsonia Meriana*, Miller (not W. fulgida, Sal., as named by Klatt).

δ = *Watsonia brevifolia*, Ker (not W. humilis, Gawl, as written on the sheet by Klatt).

ϵ = *Watsonia humilis*, Miller (not W. Meriana, Gawl, as named by Klatt).

N. E. Brown does not agree with Juel who identified the 5 specimens with W. marginata, (L.f.) Ker.

32. G. merianellus, (L.) Thunb. Diss. Glad., p. 14 (1784).—One sheet.—" Cap. Thunberg."

This is *Antholyza merianella*, L. Not Gladiolus Watsonius, Thunb, as named by Klatt.

33. G. merianus, (L.) Thunb. Diss. Glad., p. 14 (1784).—Two sheets.—" Cap. Thunberg."

Both are *Watsonia aletroides*, (Burm.) Ker.

34. G. montanus, L.f.; Thunb. Diss. Glad., p. 9, tab. 1 (1784).—One sheet.—" Cap. Thunberg."

This is *G. parviflorus*, Jacq. 1771 [syn. G. montanus, L.f. (1781); G. arenarius, Baker (as written on the sheet by Baker); Hebea orchidiflora, Eckl. and H. tabularis, Eckl. (1827); Antholyza montana, Klatt and A. orchidiflora, Klatt (1863) and A. fragrans, E. Meyer ex Klatt (1882)].

Juel in his book has retained the Linnean specific name G. montanus.

35. G. plicatus, Thunb. Diss. Glad., p. 20 (1784); non L.—Seven sheets.—"Cap. Thunberg."

α=*Babiana stricta*, Ker ex Baker (not B. villosa, Ker, as named on the sheet by Klatt).

β=*Babiana sp.* (Zeyher 4001) placed under B. stricta by Baker, but as defined by him B. stricta is a mixture of several species. It is not B. villosa, Ker, as named by Klatt.

γ=*Babiana disticha*, Ker (not B. villosa, Ker, as named by Klatt).

δ=belongs to two different species of *Babiana*, the left-hand specimen is the same as a specimen at Kew from Lion Mountain named "B. coerulescens" by someone, and by Baker called B. plicata, Ker; the right-hand specimen is the same as Drège 8384, named B. plicata by Baker (neither being B. villosa, Ker, as named on the sheet by Klatt).

ε=*Babiana sp.*, which N. E. Brown failed to identify. Not B. villosa, Ker, as named by Klatt!

ζ=*Babiana sp.* Not B. mucronata, Gawl, as written on the sheet by Klatt.

η=*Babiana plicata*, (Thunb.) Ker. Not B. sulphurea, Ker, as named by Klatt.

36. *G. punctatus*, Thunb. Prodr., p. 185 (1800).—One sheet.—"Cap. Thunberg". N. E. Brown has retained the Thunbergian name *G. punctatus* (not of Jacquin!). It is not G. carneus, De la Roche, as named by Klatt.

37. G. recurvus, Thunb. Diss. Glad., p. 9 (1784); non L. !—Two sheets, each containing a different species.—"Cap. Thunberg."

α=*Hesperantha recurva*, (Thunb.) Ascherson et Graebner. Not Hesperantha graminifolia, Sweet, as named on the sheet by Klatt.

β=*Hesperantha setacea*, Eckl. Not H. radiata, Gawl, as named by Klatt.

Juel has placed both specimens under H. radiata, (Jacq.) Ker.

38. G. ringens, Thunb. Prodr., p. 186 (1800).—Five sheets, each containing a different species of *Babiana*.—"Cap. Thunberg."

α=MacOwan, Herb. Norm. Austr. Afr., 273, placed under *Babiana plicata*, (Thunb.) Ker by Baker. Not B. nana, Spreng. as named by Klatt.

β=Zeyher 1616, *Babiana sp.* Not B. obtusifolia, Jacq., as named by Klatt.

γ=*Babiana spp.*; the right-hand specimen is indeterminable, the left-hand specimen is the same as a specimen at Kew from Riebeek Kasteel without number or name of collector. Neither of them being B. sambucina, Gawl, as named by Klatt.

δ, two specimens, belonging to different species, neither of them B. reflexa, Eckl., as named by Klatt. The left-hand specimen is *Babiana disticha*, Ker, the right-hand specimen is a *Babiana sp.* which could not be determined.

ε=a very distinct species of *Babiana* which like the specimens on sheets β and γ could not be identified. It is not B. mucronata, Jacq., as named by Klatt.

39. G. secundus, Thunb. Prodr., p. 186 (1800), and in Nat. Selsk. Köbenh., p. 14, tab. 4 (1810).—One sheet.—"Cap. Thunberg."

This is *Babiana secunda*, (Thunb.) Ker. The colour of the flower, a lilac-blue shade, is well preserved. B. reflexa, Eckl. as named by Klatt, is a synonym.

40. G. setifolius, L.f. Suppl., p. 96 ("Thunb.") (1781); Thunb. Diss. Glad., p. 18 (1784).—One sheet.—"Cap. Thunberg."

    This is *Lapeyrousia setifolia*, (L.f.) N. E. Br. comb. nov.; syn. L. divaricata, Baker (not Anomatheca juncea, Gawl, as named by Klatt on the sheet).

41. G. Sparrmanni, Thunb. Vet. Acad. Handl., p. 189, tab. IXA (1814).—Two sheets.

    α=*Freesia Sparrmanii*, (Thunb.) N. E. Br. (not F. refracta, Klatt, as named by Klatt on the sheet).—"Cap. Sparrman"!

    β=possibly a var. of the plant known in gardens as F. refracta alba (=*F. lactea*, Fenzl.) with the segments purple on the back; the colour of the flower in this specimen is well preserved and quite distinct.—Not. F. refracta, as named by Klatt.—"Cap. Thunberg."

42. G. spathaceus, L.f. Suppl., p. 96 ("Thunb.") (1781); Thunb. Diss. Glad., p. 22 (1784).—One sheet.—"Cap. Thunberg."

    This is *Babiana spathacea*, (L.f.) Ker, and must be taken as the type of G. spathaceus, L.f. (1781). Not B. tubiflora, Gawl, as written on the sheet by Klatt.

43. *G. speciosus*, Thunb. Fl. Cap. ed. Schultes, p. 48 (1823).—One sheet.—"Cap. Thunberg."

    This species is omitted from Juel's "Plantae Thunbergianae."

44. G. spicatus, L.; Thunb. Diss. Glad., p. 15 (1784).—One sheet.—"Cap. Thunberg."

    A species of *Watsonia*; Baker and Klatt considered it to be W. punctata, Ker, but it seems to differ in having flat leaves.

45. G. spiralis, Pers.; Thunb. Herb. (first named by Persoon).—Two sheets.—"Cap. Thunberg."

    α, left-hand specimen=*Watsonia brevifolia*, Ker; right-hand specimens (2)=*W. humilis*, Miller (det. L. Bolus!).

    β=*W. roseo-alba*, Ker, according to Mrs. Bolus. It is not W. brevifolia, Gawl. as named by Klatt, nor W. humilis, Mill., as named by Baker. Juel erroneously placed both specimens under G. tristis, L.

46. *G. tenellus*, Jacq.; Thunb. Prodr., p. 185 (1800).—Two sheets.—"Cap. Thunberg."

    α=very likely *G. tenellus*, Jacq. and not G. trichonemifolius, Ker, as named by Klatt on the sheet.

    β=*G. trichonemifolius*, Ker, as named by Klatt.

47. G. trinervis, Thunb. Mus. nat. Upsal., Append. XXII, p. 27 (1814), name only.—One sheet.—"Cap. Thunberg."

    This is *G. parviflorus*, Jacq. (syn. G. montanus, L.f.; Antholyza orchidiflora, Klatt, as written on the sheet by Klatt, and Gladiolus (Schweiggera) arenarius, Baker, as named by Baker).

48. G. tristis, L.; Thunb. Prodr., p. 8 (1794).—Five sheets, containing three different species.—"Cap. Thunberg." (β and γ without record of origin).

    α=*Gladiolus sp.* (could not be identified).

    β=*G. maculatus*, Sweet.

    γ, δ and ε=*G. confusus*, N. E. Br. (syn. G. tenellus, Baker, not of Jacquin, as quoted by Klatt). Juel retained the Linnean name G. tristis.

49. G. triticeus, Thunb. Fl. Cap., p. 194 (1811).—One sheet.—"Cap. Thunberg."

    This is *Watsonia subulata*, Klatt (syn. G. subulatus, Vahl; G. triticeus,

Thunb.; W. punctata, Ker var. triticea, (Thunb.) Baker, as named by JUEL (the authority "Baker" has been erroneously omitted).

50. G. tubiflorus, L.f. Suppl., p. 96 ("Thunb.") (1781); Thunb. Diss. Glad., p. 20, tab. 2 (1784).—One sheet.—"Cap Thunberg."

This is *Babiana tubiflora*, (L.f.) Ker, and must be considered as the type of G. tubiflorus, L.f. which was described from a specimen collected by THUNBERG.

51. *G. undulatus*, Jacq.; Thunb. Prodr., p. 186 (1800).—Four sheets.—"Cap. Thunberg" (α without record of origin).

α=*G. cuspidatus*, Jacq. ex Baker, not G. Milleri, Ker, as named by KLATT.

β=the same plant as ZEYHER 1631, placed by BAKER under G. cuspidatus, Jacq., but it is doubtful if it is identical with that species. Not G. angustus, Ker, as named by KLATT.

γ=*G. undulatus*, Jacq.

δ=*G. cuspidatus*, Jacq.

52. *G. virescens*, Thunb. Fl. Cap., p. 196 (1811).—Two sheets.—"Cap. Thunberg."

α=*G. virescens*, Thunb. (syn. G. bicolor, Baker (1877)!). The two specimens on the paper both belong to one species, and neither of them is G. formosus, Klatt, nor G. viperatus, Ker, as written on the sheet by KLATT.

β=*G. pulchellus*, Klatt.

53. G. Watsonius, Thunb. Diss. Glad., p. 14 (1784).—Two sheets.—"Cap. Thunberg."

α=*Antholyza revoluta*, Burm.

β=*Watsonia spectabilis*, Schinz.

Ixia, L.

This S. African genus as represented in the THUNBERG Herbarium includes species of the genera *Geissorhiza* (many!), *Sparaxis*, *Romulea*, *Hesperantha*, *Lapeyrousia*, *Tritonia*, *Nivenia* (1), *Gladiolus*, *Dierama* (1) and one species of *Pauridia*, a genus belonging to the Amaryllidaceae.

1. *I. aristata*, Thunb. Diss. Ixia, p. 14 (1783).—Four sheets.—"Cap. Thunberg."

α=*I. aristata*, Thunb. (1783), not of Ker, nor of BAKER. Not I. conica, Salisb., as named by KLATT on the sheet.

β=*I. elegans*, N. E. Br. comb. nov. (syn. I. aristata var. elegans, Baker, Handb. Irid., p. 162, not of Fl. Cap.; Wurthia elegans, Regel, Gartenfl. 1853, p. 98, tab. 46, f. 2).—THUNBERG's specimen is not I. patens, Gawl, as named by KLATT.

γ=*Ixia sp.* Its leaves are nearly as long as the stem, a character that does not agree with THUNBERG's description of I. aristata.

δ=*I. micrandra*, Baker, not I. patens, Ait. nor I. leucantha, Jacq. nor I. candida, Red., as named by KLATT.

2. I. bicolor, Thunb. Hoffm. Phyt. Blätt., p. 3 (1803).—Two sheets.—"Cap. Thunberg."

α=*Geissorhiza bicolor*, (Thunb.) N. E. Br. comb. nov. Not G. purpureolutea, Baker, as named by BAKER, nor G. Rocheana, Sweet, as named by KLATT.

β=*Geissorhiza humilis* var. *grandiflora*, Baker. Not Trichonema caulescens, Gawl, as named by KLATT.

3. I. bulbifera, L. ; Thunb. Diss. Ixia, p. 15 (1783).—Four sheets, β, γ, δ and ϵ.—"Cap. Thunberg."

   β=*Sparaxis bulbifera*, (L.) Ker (also according to JUEL). The specimen on this sheet is named by KLATT : "S. bulbifera, *Ait.*"

   γ and δ=*Sparaxis fimbriata*, Ker. Not S. grandiflora, Ait., as named by KLATT.

   ϵ=*Sparaxis atropurpurea*, Klatt. The dark purple colour of the perianth is still very distinct. Not S. grandiflora, Ait. var. purpurea, nor S. stellaris, Sweet, as written on the sheet by KLATT.

4. I. bulbocodium, L. ; Thunb. Diss. Ixia, p. 6 (1783).—Seven sheets, but only two of them from S. Africa.

   α=*Romulea similis*, Eckl. according to BAKER. Not Trichonema cruciatum, Gawl, as named by KLATT.—"Cap. Thunberg."

   γ=*Romulea rosea*, Eckl. according to BAKER. It is the same plant as ZEYHER 1605 ! with brown margins to the inner bract. Not Trichonema chloroleucum, Ker, as named by KLATT.—"Cap. Thunberg."

   ς=*Romulea rosea*, Eckl. according to BAKER (doubtful !).—"I. rosea Hort. m. eo nomine ex Hort. Kewensi."

5. *I. capillaris*, L.f. Suppl., p. 92 ("Thunb.") (1781) ; Thunb. Diss. Ixia, p. 12, with a reduced fig. (1783).—Two sheets.—"Cap. Thunberg."

   Both are *I. capillaris*, L.f. (1781).

6. I. cinnamomea, L.f. Suppl., p. 92 ("Thunb.") (1781) ; Thunb. Diss. Ixia, p. 10, tab. (2) (1783).—One sheet.—"Cap. Thunberg."

   This is *Hesperantha cinnamomea*, (L.f.) Ker. Its leaves are characterized by crisped edges.

7. I. coccinea, Thunb. Fl. Cap., p. 207 (1811).—Two sheets.—"Cap. Thunberg."

   α=*I. speciosa*, Andr. and not I. crateroides, Gawl, as named by KLATT on the sheet.

   β=*I. patens*, Ait. KLATT named this specimen I. patens, *Gawl.*

8. I. corymbosa, L. ; Thunb. Diss. Ixia, p. 11 (1783).—Two sheets.—"Cap. Thunberg."

   α ("alba")=*Lapeyrousia purpureolutea*, Baker. Not Ovieda corymbosa, Spreng., as named by KLATT.

   β ("caerulea")=*Lapeyrousia azurea*, Eckl. JUEL collected both specimens under the name Lapeyrousia corymbosa, (L.) Ker.

9. I. crispa, L.f. Suppl., p. 91 ("Thunb.") (1781) ; Thunb. Diss. Ixia, p. 9, tab. (2) (1783).—Two sheets.—"Cap. Thunberg".

   Both specimens, characterized by very narrow crisped leaves, belong to *Tritonia undulata*, (Burm.) Baker and match the type of I. crispa, L.f.

10. I. crocata, L. ; Thunb. Diss. Ixia, p. 17 (1783).—Two sheets.—"Cap. Thunberg."

    α=*Tritonia crocata*, (L.) Ker. (not Ait. as quoted by KLATT).

    β=*Tritonia deusta*, Ker.

11. I. crocea, Thunb. Fl. Cap., p. 218 (1811).—One sheet.—"Cap. Thunberg."

    This is *Romulea sublutea*, (Lam.) Baker [syn. I. sublutea, Lam. (1789)]. Not Trichonema speciosum, Ker, as named by KLATT.—The yellow colour of the flowers is well preserved.

12. I. elliptica, Thunb. Hoffm. Phyt. Blätt., p. 4 (1803).—one sheet.—"cult. in Horto Kewensi. Afzelius."

This is *Lapeyrousia juncea*, Pourr.=Gladiolus junceus, L.f. (1781). Not Geissorhiza excisa, Ker, as named by KLATT.

13. I. erecta, Berg.; Thunb. Diss. Ixia, p. 16 (1783).—Three sheets.—"Cap. Thunberg."

All *I. erecta*, Thunb., but not I. erecta, *Berg.*, which is a synonym of I. polystachya, L. which name is erroneously quoted by JUEL as the valid one. The specimen on sheet 2 has been named by KLATT I. pentandra, L.

14. I. excisa, L.f. Suppl., p. 92 ("Thunb.") (1781); Thunb. Diss. Ixia, p. 19, tab. (1) (1783).—Two sheets.—"Cap. Thunberg."

α=*Geissorhiza excisa*, (L.f.) Ker (also according to JUEL) and is the same as the type of I. excisa, L.f. (1781).

β=*Geissorhiza sp.* It is not G. recurvifolia, Klatt, as named by KLATT.

15. I. falcata, L.f. Suppl., p. 92 ("Thunb.") (1781); Thunb. Diss. Ixia, p. 19, tab. (1) (1783).—Four sheets.—"Cap. Thunberg."

α and β=*Hesperantha falcata*, (L.f.) Ker (also according to JUEL), and identical with the type of I. falcata, L.f.

γ contains two species. Three specimens on the sheet belong to *Hesperantha pilosa*, Ker.; the fourth specimen could not be determined, but it is not H. graminifolia, Sweet, as named by KLATT.

δ=a small-flowered form of (or a species allied to) the plant BAKER has called *Geissorhiza imbricata*, Ker. Not Hesperantha falcata, Ker, as named by KLATT and quoted by JUEL, nor Geissorhiza Brehmii, Eckl., as named by BAKER.

16. I. fenestrata, Thunb. in Hoffm. Phyt. Blätt., p. 4 (1803).—One sheet.—"Cap. Thunberg inter Söndags- et Visch-rivier."

This is *Tritonia laxifolia*, Benth. Not Montbretia laxifolia, Klatt, as named by KLATT.

17. I. hirta, Thunb. Diss. Ixia, p. 9 (1783).—One sheet.—"Cap. Thunberg."

This is *Geissorhiza hirta*, (Thunb.) Ker. Not G. quinquangularis, Eckl., as named by KLATT.

18. I. humilis, Thunb. Diss. Ixia, p. 8 (1783).—Four sheets.—"Cap. Thunberg."

α=*Geissorhiza humilis*, (Thunb.) Ker. Not G. Brehmii, Eckl., as named by KLATT.

β and γ=*Ixia sp.* (indeterminable), but they are specimens of a species nearest G. humilis var. grandiflora, Baker, though the bracts and flowers seem different. It is not identical with G. Brehmii, Eckl., as named by KLATT.

δ=*Geissorhiza graminifolia* var. *bicolor*, Baker, and is the same as MACOWAN, Herb. Norm., p. 261. Not G. quinquangularis, Eckl., as named by KLATT on the sheet.

19. I. lancea, Thunb. Diss., Ixia, p. 18 (1783); non Jacq.!—One sheet, containing five good specimens.—"Cap. Thunberg."

This plant being different from I. lancea, Jacq., N. E. BROWN proposed to retain the much older generic name by calling the plant *Tritonia lancea*, (Thunb.) N. E. Br. comb. nov. [syn. I. lancea, Thunb. (1783), not I. lancea, Jacq. (1796)]. It is not T. crispa, as named by KLATT on the sheet.

20. I. linearis, L.f. Suppl., p. 92 ("Thunb.") (1781); Thunb. Diss. Ixia, p. 12 (1783).—One sheet.—"Cap. Thunberg."

This plant is a *Gladiolus* and not an Ixia; it is identical with G. biflorus,

Klatt in Trans. S. Afr. Phil. Soc. III, p. 197 (1885). But as the Linnean name has priority, N. E. Brown retained it for this species by calling the plant *Gladiolus linearis*, (L.f.) N. E. Br. comb. nov. It is not Gladiolus debilis, Sims, as named by Klatt on the sheet.

21. *I. maculata*, L. ; Thunb. Diss. Ixia, p. 16 (1783).—Nine sheets.—" Cap. Thunberg."

α=*Tritonia stricta*, Klatt and is identical with Zeyher 4008. It is not I. retusa, as named by Klatt.

β=*Ixia sp.* (indeterminable). It is different from Gladiolus debilis, Sims, as named by Klatt.

γ=named *I. conica*, Salisb. by Klatt, but the correctness of this identification is found doubtful by N. E. Brown, who failed to identify this specimen.

ς=*I. columellaris*, Ker. Not I. maculata, Jacq., as named by Klatt.

ι=*I. monadelpha*, De la Roche, not I. capillaris, Bot. Mag., as named by Klatt.

The other four sheets, δ, ϵ, η, and θ appear to contain variations of *I. maculata*, L. (respectively named by Klatt on the sheet : I. curta, Andrews ; I. columellaris, Gawl. ; I. curta, Andrews and I. conica, Salisb.). Juel in his " Plantae Thunbergianae " collected all specimens under the name I. maculata, L.

22. I. minuta, L.f. Suppl., p. 92 (" Thunb.") (1781) ; Thunb. Diss. Ixia, p. 6, tab. (1) (1783).—One sheet.—" Cap. Thunberg."

This is *Pauridia minuta*, (L.f.) Dur. et Schinz, syn. P. hypoxidoides, Harv., as named by Juel in "Plant. Thunberg." and also by Baker on the sheet. The former name being much older, it must take precedence.

It is a very dwarf species belonging to the Amaryllidaceae.

23. I. monanthos, Thunb. Fl. Cap., p. 226 (1811) ; non Delar.!—One sheet.—" Cap. Thunberg."

This specimen belongs to *Geissorhiza Bellendeni*, MacOwan. It is not G. Rocheana, Sweet, as named by Klatt, nor G. Rochensis, Ker var. monanthos, (Thunb.), as quoted by Juel.

24. I. pendula, L.f. Suppl., p. 91 (" Thunb.") (1781) ; Thunb. Diss. Ixia, p. 15 (1783).—One sheet.—" Cap. Thunberg."

This is *Dierama pendulum*, (L.f.) Baker. From N. E. Brown's paper it may be quoted that under this name Baker has confused two or three other species. But the type is a native of Uitenhage and Humansdorp Divisions, Zeyher 918 ! It is not D. ensifolium, Koch et Bouché, as named by Klatt.

Its drooping flowers on long stalks give this plant a most graceful appearance.

25. I. pentandra, L.f. Suppl., p. 92 (" Thunb.") (1781) ; Thunb. Diss. Ixia, p. 18 (1783).—Two sheets.—" Cap. Thunberg."

Both are identical with *Tritonia scillaris*, (L.) Baker, and the same as I. pentandra, L.f., the specimen on sheet β being a remarkable pentandrous form.

26. I. pilosa, L.f. Suppl., p. 92 (" Thunb.") (1781) ; Thunb. Diss. Ixia, p. 8 (1783). —One sheet, containing three distinct species.—" Cap. Thunberg."

One is *Hesperantha pilosa*, (L.f.) Ker, another may be *Hesperantha falcata*, Ker., while the third seems to be a species of *Geissorhiza* near G.

pauciflora, Baker, but with a different corm. JUEL and KLATT have collected all three specimens under the name H. pilosa.

27. *I. polystachya*, L.; Thunb. Fl. Cap., p. 240 (1811).—Two sheets.—"Cap. Thunberg."

α=*I. polystachya*, L., not I. dubia, Vent., as named by KLATT on the sheet.

β=*Ixia sp.* (indeterminable); it is not I. conica, Salisb., as named by KLATT. The flowers appear to have been rosy or purplish.

28. I. radians, Thunb. Hoffm. Phyt. Blätt., p. 3 (1803).—Two sheets.—"Cap. Thunberg."

Both belong to *Geissorhiza Rochensis*, Ker. The specimen on sheet β has been named by KLATT: Trichonema roseum, Gawl.

29. I. reflexa, Thunb. Fl. Cap., p. 220 (1811).—Five sheets.—"Cap. Thunberg."

α, β, γ and δ=*Romulea bulbocodioides*, (Delar.) Baker. Not Trichonema caulescens, Gawl, as named by KLATT on the sheets.

ϵ=*Romulea bulbocodioides* var. *elongata*, Baker (I. reflexa elongata of THUNBERG, type specimen!), and not Trichonema caulescens, Gawl, as named by KLATT.

30. I. reticulata, Thunb. Fl. Cap. ed. Schultes, p. 60 (1823).—One sheet.—"Cap. Thunberg."

This is *Tritonia lineata*, (Salisb.) Ker. Not T. rosea, Klatt, as named by KLATT, nor Montbretia lineata, Baker, as written on the sheet by BAKER.

31. *I. scariosa*, Thunb. Fl. Cap., p. 243 (1811).—One sheet.—"Cap. Koude Bockefeld, octobri. Thunberg."

This is *I. scariosa*, Thunb. and may be possibly the same as I. incarnata, Jacq. Icon, Rar. t. 282 (1796). Not I. capillaris, Bot. Mag., as named by KLATT.

32. I. scillaris, Thunb. Diss. Ixia, p. 13 (1783).—Two sheets.—"Cap. Thunberg."

α=*Geissorhiza setifolia*, Eckl., not of Baker. It is not G. setacea, Ker, as named by KLATT.

β=*Geissorhiza sp.*; neither G. setacea, Ker, as named by KLATT, nor G. humilis var. bicolor, Baker, to which BAKER has referred it in the Flora Capensis, Vol. VI, p. 67. JUEL in his "Plantae Thunbergianae" ascribed both specimens to Geissorhiza secunda, (Delar.) Ker.

33. I. secunda, Delar.; Thunb. Diss. Ixia, p. 9 (1783).—Two sheets.—"Cap. Thunberg."

α=*Geissorhiza secunda*, (Delar.) Ker.

β=*G. secunda* var. *ramosa*, Klatt.

34. I. setacea, Thunb. Diss. Ixia, p. 13 (1783).—One sheet.—"Cap. Thunberg."

This is *Geissorhiza setacea*, (Thunb.) Baker. Not G. recurvifolia, Klatt, as named by KLATT.

35. I. squalida, Thunb. Hoffm. Phyt. Blätt., p. 4 (1803).—One sheet.—"Cap. Thunberg."

This is *Tritonia securigera*, Ker [syn. Gladiolus securiger, Ait. (1789)]. Not Montbretia securigera, DC., as named by KLATT on the sheet.

36. I. viridis, Thunb. Fl. Cap., p. 242 (1811).—Two sheets.—"Cap. Thunberg."

This is *I. viridiflora*, Lam. (1789), the beautiful green Ixia. The specimens on both sheets are well recognizable, and particularly the flowers on sheet β have kept their remarkable green shade. A photograph of sheet β is

reproduced herewith (*vide* Plate VI.); the sheet is labelled on the back "e Capite bonae Spei C. P. Thunberg."

Morea, Mill.

This genus as represented in the THUNBERG Herbarium includes but 8 *Moreas*, the remainder of the specimens belonging to the genera *Aristea* (8 species), *Bobartia* (4), *Homeria* (3), *Hexaglottis* (2), *Dietes* (1), *Cleanthe* (1), *Lapeyrousia* (1), *Sisyrinchium* (1), *Ferraria* (1) and *Belemcanda* (1). Two of them are no natives from S. Africa, viz. *Sisyrinchium angustifolium*, Mill. (Moraea Bermudiana, (L.) Thunb. δ) and *Belemcanda chinensis*, Lem. (Moraea chinensis, (L.) Thunb.).

From N. E. BROWN's publication it is learned that the correct spelling of the name of this genus is *Morea* instead of Moraea. MILLER, in his "Figures of Plants," Vol. II, p. 159, tab. 238, published in the part of the work that was issued June 27th, 1758 (the date for the whole volume being given on the title page as 1760), describes and figures a plant upon which he founds and properly characterizes the genus *Morea* "in honour of Robert More Esquire of Shropshire." LINNAEUS has accepted MILLER's genus in the 2nd edition of his "Species Plantarum," p. 59, published in 1762, but altered the spelling of the generic name to Moraea, an error that has persisted ever since. BROWN writes that it is probable that the similarity of the name *Morea* to the maiden name MORAEUS of LINNAEUS' wife led to his misspelling it. However, as the genus *Morea* was published after 1753, properly characterized and figured, and as LINNAEUS accepted it as MILLER's genus (see LINNAEUS, Genera Plantarum, ed. 6, p. 27 (1767), where he copies the characters of the genus as given by MILLER), MILLER's original spelling has the priority.

Under the generic name *Iris* THUNBERG has collected in his herbarium numerous species, many of them being S. African and for the greater part belonging to the genus *Morea*, the remainder consisting of a few species of *Dietes*, *Homeria* and *Helixyra*.

LILIACEAE.

Albuca, L.

Under the generic name *Albuca* we found 6 species collected in the THUNBERG Herbarium, one of them belonging to another genus.

1. *A. fastigiata*, Dryand.; Thunb. Vet. Acad. Nya Handl., p. 58 (1786).—Three sheets.—"Cap. Thunberg."

   The specimen on sheet γ is somewhat different and labelled by THUNBERG: A. fast. γ. thyrsiflora ?"
2. *A. major*, L.; Thunb. Vet. Acad. N. Handl., p. 57 (1786).—Two sheets.

   Sheet α is marked on the back: "cult. in H. Upsal." (grown in the Uppsala Botanic Garden).

   The specimen on sheet β originates from the Cape (THUNBERG).
3. *A. minor*, L.; Thunb. Vet. Acad. N. Handl., p. 58 (1786).—One sheet.—"Cap. Thunberg e Roggeveld."
4. *A. spiralis*, L.f. Suppl., p. 196 ("Thunb.") (1781); Thunb. Vet. Acad. N. Handl., p. 59, tab. II, fig. 1 (1786).—Two sheets.—"Cap. Thunberg."

   Sheet α contains a spirally wound flower-stem.

5. *A. viscosa*, L.f. Suppl., p. 196 (" Thunb.") (1781); Thunb. Vet. Acad. N. Handl., p. 58 (1786).—One sheet.—" Cap. Thunberg."

   Flowering specimen with bulb. This species is characterized by its very narrow, grasslike leaves.

6. A. altissima (?). This is not an Albuca, but very likely *Urginea altissima*, (L.f.) Baker (syn. Ornithogalum altissimum, L.f.).—One sheet.

   The specimen by which this species is represented shows a stout plant with much broader leaves than of the foregoing species.

Aloe, L.

The Aloes in the THUNBERG Herbarium have been revised by the late Dr. N. E. BROWN, A.L.S. and described in " Bothalia," Vol. I, Part III: *The Genera Aloe and Mesembryanthemum as represented in Thunberg's Herbarium* (1923).

As a matter of fact in most genera we have examined in this herbarium the material was quite satisfactory, in many cases really excellent. However, this remark does not apply to the genus *Aloe*, for we found the specimens of most of the species consist of detached leaves and flower-stems, and in some instances the leaves and inflorescences of what are supposed to belong to one species, represent two distinct species and even different genera. Dr. BROWN writes that such a mixture is so unlike the usual excellence of THUNBERG's specimens, that it must be attributed to the succulent nature and often large size of the plants and the difficulty THUNBERG must have had in properly making good, dried specimens of them while travelling as he did at the date.

Evidently his specimens of detached leaves and flowers must have become mixed in the press and THUNBERG must have sometimes forgotten which leaves belonged to the flowers. Moreover it is quite possible that some of the mixtures may have been made when, after his return to Sweden, he remounted the specimens, —originally mounted upon small sheets of thin paper—on larger sheets of thicker paper.

N. E. BROWN has checked the names as given by THUNBERG and in the following enumeration of the Aloes in the THUNBERG Herbarium, the plants have been named accordingly.

1. A. arachnoides, (Mill.) Thunb. Diss. Aloë, p. 7 (1785).—One sheet.

   THUNBERG's specimen consists of three tufts of leaves and three racemes of flowers. The latter are detached, but have been inserted among the leaves; two of them certainly belong to a different species, only that of the middle specimen might belong to the same species.

   The leaves belong to *Haworthia arachnoides*, Duval 1809 (syn. H. arachnoides, Haw. 1812; A. arachnoidea, Mill. 1768, and A. arachnoides, (Mill.) Thunb. 1785).

2. *A. dichotoma*, L.f. Suppl., p. 206 (" Thunb."); Thunb. Diss. Aloë, p. 4 (1785).—One sheet.—" Cap. Thunberg."

   The sheet contains two short, longitudinal sections of the stem, one showing the very smooth bark and the other the interior fibre, and one leaf.

   This is *A. dichotoma*, Masson in Phil. Trans. Roy. Soc., London (1776), Vol. LXVI, Part I, p. 310. MASSON's description of the so-called " Kokerboom" being 5 years older than that of LINNAEUS the younger (1781), MASSON ought to be quoted as the authority of this species instead of L.f. The description MASSON gives of this strange looking Aloe as quoted by N. E.

Brown in his paper, is very distinct and a far better one than that we owe to the younger Linnaeus.

3. A. disticha, Thunb. Diss. Aloë, p. 7 (1785); non L. !—Two sheets, numbered 1 and 2.

   Both contain very good specimens of a new species of *Gasteria*, for which N. E. Brown proposed the name *G. Thunbergii*, N. E. Br. It is not Gasteria verrucosa, (Mill.) Haw., as named by Juel.

4. *A. humilis*, Mill.; Thunb. Diss. Aloë, p. 6 (1785).—One sheet.—"cult. in H. Upsal. Thunberg."

   One small tuft of leaves and two good flowering stems. We find stated on the back of the sheet that this material originates from a plant cultivated in the Uppsala Botanic Garden.

5. A. lingua, Thunb. Diss. Aloë, p. 8 (1785).—One sheet.—We found the specific name written by Thunberg as lingva.

   The specimen consists of two leaves and two flowering stems.

   This is *A. plicatilis*, Mill. 1768 (syn. A. linguaeformis, L.f. 1781, not of Miller). It is not Gasteria disticha, (L.) Haw., as quoted by Juel in his "Plantae Thunbergianae."

6. A. maculata, Thunb. Diss. Aloë, p. 8 (1785).—Two sheets, numbered α and β.

   Sheet α contains portions of two leaves and a raceme of what N. E Brown believes to be *Gasteria pulchra*, Haw.

   Sheet β (which also has the name "obliqua Haw.", written upon it in pencil) contains the leaf of some large and broad-leaved species of *Gasteria*, totally different from G. pulchra, which could not be identified, and two flower-spikes of some species of *Aloe*, also indeterminable.

   Juel has collected all specimens under the name Gasteria maculata (Thunb.) Haw.

7. A. perfoliata, L.; Thunb. Diss. Aloë, p. 5 (1785).—Three sheets, marked α, β and γ.

   Sheet α contains one leaf about 7 inches long and $2\frac{3}{4}$ inches broad, a tuft of four small leaves about $2\frac{1}{2}$ inches long and 1 inch broad, and two single flowers. These fragments are likely to belong to three different species, none of them could be named with certainty.

   Sheet β contains part of a leaf and two inflorescences which are believed to belong to *A. latifolia*, Haw.

   Sheet γ contains part of a leaf and a flower-spike of *A. vera*, L. and is labelled on the back: "ex India occidentali, Forsström" (sent from the West Indies by Forsström, where A. vera has been introduced from the Canaries).

8. A. pumila, Thunb. Diss. Aloë, p. 7 (1785).—Two sheets.

   Sheet α contains a tuft of leaves of *Haworthia fasciata*, Haw. on the left-hand side, and on the right-hand side a tuft of leaves of *Haworthia granata*, Haw. Each of them has a flower-stem placed among them, but detached, which may or may not belong to the leaves.

   Sheet β containing two leaves and a paniculately branched flowering stem (a very stout inflorescence with 6 branches !), may be *Haworthia margaritifera*, Haw., but the material is too poor to make the identification certain.

The specimens on sheet α are from plants cultivated in the Uppsala Botanic Garden.

9. A. retusa, L. ; Thunb. Diss. Aloë, p. 10 (1785).—One sheet.—" Cult. in H. Upsal. Thunberg."

The specimen of this consists of a fragment of a plant with two leaves and a flower-stem attached, five detached leaves, and a detached inflorescence, all belonging to *Haworthia retusa*, (L.) Duval (not Haw., as quoted by JUEL). The specimen is labelled on the back of the sheet as being from a plant cultivated in the Uppsala Botanic Garden.

10. *A. spicata*, L.f. Suppl., p. 205 ("Thunb.") (1781).—Thunb. Diss. Aloë, p. 4 (1785).—One sheet.

THUNBERG's specimen, consisting of portions of two leaves and six detached flowers, is the type of this species.

11. A. spiralis, L. ; Thunb. Diss. Aloë, p. 9 (1785).—One sheet.—" cult. in H. upsal."

A small tuft of leaves which probably belongs to *Apicra spiralis*, Baker (1880) and a detached inflorescence of some species of *Gasteria*, which is quite indeterminable.

12. A. succotrina=A. sinuata, Thunb. Diss. Aloë, p. 6 (1785).—One sheet.

Bearing the name A. succotrina in THUNBERG's handwriting we found a sheet containing a specimen listed by JUEL in his " Plantae Thunbergianae " under the name A. sinuata, Thunb. According to N. E. BROWN this sheet contains part of a leaf of *A. fruticosa*, Lam., part of a leaf of *A. spicata*, L.f., and part of a raceme of flowers of some species of *Aloe* which is quite indeterminable. The specimen does not belong to A. succotrina, *Lam.*, as given as the valid name by JUEL.

If A. sinuata, Thunb. is considered to be founded by THUNBERG upon the plant enumerated by LINNAEUS in his " Species Plantarum " (ed. 1, p. 320, and ed. 2, p. 458) as A. perfoliata, var. ξ, which is based upon " Aloe succotrina angustifolia spinosa, flore purpurea " of COMMELIN, " Horti Medici Rariorum Plantarum ", Vol. I, p. 94, tab. 48 (1697), it must be placed as a synonym of A. succotrina, Weston (1770), but if it is held to be founded upon the sheet bearing the name A. succotrina in the THUNBERG Herbarium, then the name A. sinuata must disappear altogether.

13. *A. variegata*, L. ; Thunb. Diss. Aloë, p. 9 (1785).—One sheet.

THUNBERG's specimen consists of two leaves with the variegation upon them quite distinct, and a single flower.

14. A. viscosa, L. ; Thunb. Diss. Aloë, p. 9 (1785).—One sheet.

The sheet of this species in THUNBERG's Herbarium contains three flowering specimens, marked by N. E. BROWN : A, B and B.

A (the central specimen) which is larger than the others, belongs to *Haworthia viscosa*, (L.) Haw.—B (the lateral specimens) may belong to a variety of *H. viscosa*, (L.) Haw. or possibly represent a different species allied to it.

Eriospermum, Jacq.

This remarkable genus we found represented in the THUNBERG Herbarium by one species only, viz. :

1. *E. latifolium*, Jacq. ; Thunb. Fl. Cap. ed. Schultes, p. 317 (1823). Syn.: E.

capense, (L.) Thunb. Fl. Cap., p. 294 (1820); Ornithogalum capense, L.; Thunb. Prodr., p. 62 (1794).—One sheet.—" Cap. Thunberg."

Sansevieria, Thunb.

The above genus we found represented in the THUNBERG Herbarium by two species, viz.:

1. S. aethiopica, Thunb. Prodr., p. 65 (1794).—Two sheets.—" Cap. Thunberg."
   The specimens on both sheets belong to *S. zeylanica*, (Jacq.) Willd.
   On sheet 1 the specimen has been originally named by THUNBERG " Aletris aethiopica," but later on the generic name has been crossed out and replaced by the name *Sansevieria*, which was written above it.
   The specimen on sheet 2 is named by THUNBERG " Sanseverina aethiopica."
2. *S. thyrsiflora*, Thunb. Prodr., p. 65 (1794.)—One sheet.
   THUNBERG has written on the sheet : " Sanseverin*ia* thyrsiflora. Alethris hyacinthoides ? gvineensis ? ", while it is labelled on the back " Cult. in Italia."

Veltheimia, Gled.

This small S. African genus as represented in the THUNBERG Herbarium includes two species of *Veltheimia* and one *Kniphofia*.

1. V. capensis, (L.) Thunb. Fl. Cap., p. 278 (1820), idem ed. Schultes, p. 309 (1823). Syn. Alethris capensis, L.; Thunb. Prodr., p. 60 (1794).—One sheet.—" cult. in H. Upsal. Thunberg."
   This is the same as *V. viridifolia*, Jacq., which name has the priority as being much older than the Thunbergian name (*V. viridifolia*, described and pictured by JACQUIN in his " Plantarum rariorum Horti Caesarei Schoenbrunnensis, 1797).
   JUEL has quoted this species under the name V. viridi*flora*, Jacq. which must be considered as being incorrect. The specimen originates from the Uppsala Botanic Garden.
2. *V. glauca*, Jacq.—One sheet.—"Cap. Thunberg." A species with glaucous leaves.
3. V. uvaria, (L.) Willd.; Thunb. Fl. Cap., p. 279 (1820). Syn. Alethris uvaria, (L.) Murr.; Thunb. Prodr., p. 60 (1794).—One sheet.—" Cap. Thunberg."
   Kniphofia aloides, Moench. ?

We may conclude this enumeration of S. African Liliaceae in the THUNBERG Herbarium with the only " tulip " THUNBERG has added to his collection, viz. Tulipa Breyniana, L.; Thunb. Prodr., p. 65 (1794). The specific name as written by THUNBERG on the sheet is spelled " breijniana "; the sheet is labelled on the back " Cap. Thunberg."

This is no tulip at all, but has commonly been regarded as a plant belonging to the S. African genus *Baeometra*. The name quoted by JUEL in his book is *B. columellaris*, Salisb. Miss G. J. LEWIS (Journal of S. African Botany VII, p. 57, 1941) has, however, shown that the plant in question is a Homeria, viz. H. collina Vent., which therefore becomes *H. Breyniana* (L.) Lewis nov. comb.

CYCADACEAE.

1. Zamia caffra, Thunb. Haarl. Maatsch., p. 424 (1782). Syn.: Cycas caffra, Thunb. N. A. Upsal., p. 236, tab. V (1775).—Four sheets.—" Cap. Thunberg."

Sheet 1 contains part of a ♂ inflorescence.

Sheet 2 contains portions of a ♀ inflorescence and fruit.

Sheet 3 contains two leaves and on sheet 4 we find a leaf characterized by coarser pinnae.

All specimens belong to *Encephalartos caffer*, (Thunb.) Miq., a species of "Kaffirbread."

2. Zamia pumila (?).—One sheet, containing some leaves. A species of Encephalartos ?

TAXACEAE.

The genus *Taxus* as represented in THUNBERG's Herbarium includes 4 species of the genus *Podocarpus*, L'Hérit., the S. African "Yellow-woods" or "Geelhout". We may confine ourselves to mention here the "True Yellow-wood," *Podocarpus latifolia*, (Thunb.) R. Br., introduced by THUNBERG under the name Taxus latifolia, Thunb. and first described by him in his Prodr., p. 117 (1800).—One sheet, labelled on the back: "e Cap. sylvis Houtniqvas, Grootvadersbosch, aliis. Thunberg. Incolis: Geelhout."

MISCELLANEOUS NOTES.

LILIACEAE. The *Anthericums* in the THUNBERG Herbarium number rather more than 30 species, nearly all being natives of the Cape. This genus appears to have been revised by C. E. Moss and has been found to include species of *Bulbine* (many !), *Urginea*, *Chlorophytum*, *Trachyandra* and of the non-S. African genus *Dianella*.

ORCHIDACEAE. The S. African orchids are well represented in the THUNBERG Herbarium and have been revised by the late Dr. N. E. BROWN.

When examining the Orchidaceae we came across numerous species of *Disa*, which have been found to include a number of species belonging to the genera *Herschelia*, *Monadenia*, *Satyrium*, *Schizodium* and even a European species, *Orchis Morio*, L. (the left-hand specimen of three plants of *Disa sagittalis*, as named by THUNBERG and determined by N. E. BROWN).

There is a good specimen of the beautiful *Disa uniflora*, Berg. of Table Mountain, one of S. Africa's botanical gems, named by THUNBERG on the sheet D. grandiflora. The genus Disa was founded by P. J. BERGIUS upon this species in his "Descriptiones Plantarum ex Capite Bonae Spei" (1767). The description he gives of this plant which he named *D. uniflora*, is very good and the earliest publication of it. From a plate at the back of the volume the plant is quite recognizable. D. grandiflora, having been published much later by the younger LINNAEUS in "Supplementum Plantarum" (1781), must be placed as a synonym.

The herbarium also contains many species of the genera *Satyrium* and *Pterygodium*.

We may reproduce herewith a photograph (Plate VII.) of THUNBERG's specimen of *Satyrium carneum*, R. Br., the "Rooi trewa," which we found near Seekoe Vlei in the Cape Flats; a stately orchid with its long, conspicuous spike of rosy flowers.

This specimen is named by THUNBERG on the sheet "Satyrium cucullatum. δ.", but in N. E. BROWN's handwriting it is labelled as being "*Satyrium carneum*, Br. fide N. E. Brown." On the back of the sheet THUNBERG has written "e Cap b. spei Thunberg."

There are four sheets of S. cucullatum, Sw., marked α, β, γ and δ. On sheet α N. E. Brown has written : " Probably S. membranaceum, Sw., certainly not S. cucullatum." The specimen on sheet β is the type of *S. cucullatum*, Sw., according to N. E. Brown, and S. cucullatum γ has been identified by N. E. Brown as *S. membranaceum*, Sw. A fifth sheet, marked ϵ, contains a specimen named by Thunberg S. bicorne. The latter name is quoted by Thunberg as a synonym on the sheets α and β. Juel in his " Plantae Thunbergianae " collected all specimens under the name S. bicorne, (L.) Thunb. Prodr., p. 6 (1794).

Aizoaceae. The genus *Mesembryanthemum*, L. is well represented in the Thunberg Herbarium and appears to have been revised by the late Dr. N. E. Brown [*vide* " Bothalia ", Vol. I, Part III (1923)]. The only " mimicries " among the numerous species collected by Thunberg are M. testiculare, Thunb. Nov. Act. phys.-med. Caesar. Leop.-Carol. naturae curios., Vol. VIII (1791)=*M. testiculare*, Ait.=*Argyroderma testiculare*, (Ait.) N. E. Br., and *M. truncatum*, Thunb. Nov. Act. phys.-med. Caesar. Leop.-Carol. naturae curios., Vol. VIII (1791)=*Conophytum truncatum*, (Thunb.) N. E. Br.

The peculiar *M. moniliforme*, Thunb. we found represented by two good specimens of the plant in a resting state, viz. without leaves or flowers. This species was first described by Thunberg in Nov. Act. phys.-med. Caesar. Leop.-Carol. naturae curios., Vol. VIII (1791).

If Thunberg would be able to come back to our sphere, he would hardly believe his eyes, when seeing the countless species of *Lithops*, *Conophytum*, *Pleiospilos*, *Argyroderma*, *Rimaria*, *Gibbaeum* and other remarkable Mesembryeae, which have become known since the old days of his S. African botanical peregrinations. Yet the S. African " veld " has not been fully explored even yet and nobody knows what strange and interesting species are still to be discovered.

Hydnoraceae. A curious plant in the Thunberg Herbarium is *Hydnora africana*, Thunb., first described and figured by him in Kongl. Vet. Acad. Handl. (1775). There are two sheets of it, the second sheet is labelled on the back : " ex Africae australioris desertis. Thunberg " (from the southern deserts of Africa). The specimen of this parasitic plant, rather shapeless in dried condition, really looks like a fungus !

Ranunculaceae. The graceful *Anemone* which grows on the slopes of Table Mountain, *Anemone capensis*, (L.) Lam., we found in the Thunberg Herbarium under the name Atragene capensis, L. [described by Thunb. in his Prodr. p. 94 (1800)]. There are two sheets of it, numbered 1 and 2.—" Cap. Thunberg."

Sapindaceae. The Thunberg Herbarium also includes some material of Aitonia capensis, Thunb. Phys. Sälsk. Handl., p. 166, with fig. (1781) ; Aytonia capensis, L.f. Suppl., p. 303 (" Thunb.") (1781).—" Cap. Thunberg." This shrub which is very conspicuous when adorned with its red, inflated capsules (we saw some specimens of it along the road on an excursion from Oudtshoorn to the Cango caves) has been later named *Nymania capensis*, (Thunb.) Lindb. and classified with the Meliaceae.

Compositae. Nearly all of Thunberg's *Gnaphaliums* are Cape species. They are very numerous and for the greater part they consist of species of *Helichrysum*. Further they include *i.a.* a number of species which were found to belong to the genera *Helipterum*, *Anaxeton*, *Leontonyx* and *Metalasia*. The " Edelweiss " of the

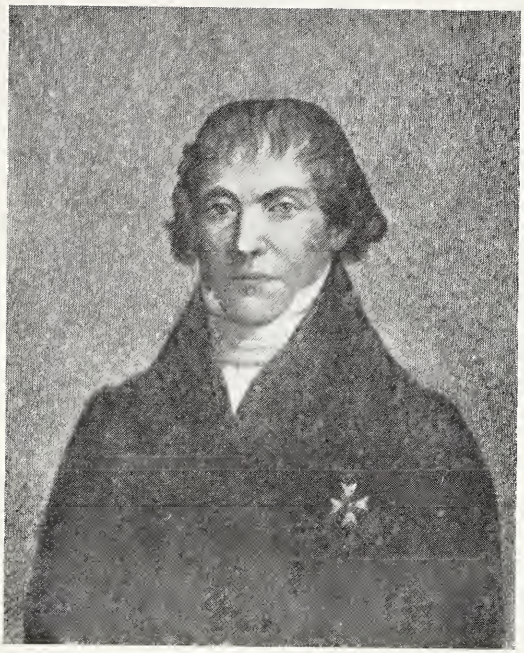
European Alps, best known under the name Gnaphalium Leontopodium (=*Leontopodium alpinum*, Cass.) is not represented in THUNBERG's collection.

CUCURBITACEAE. Nearly all of THUNBERG's "Bryonias"—a few have been brought from Japan, Java and Ceylon—are S. African plants, belonging to the genera *Melothria* (most of them!), *Kedrostis*, *Coccinia* (1 species). One species, Bryonia acutangula, Thunb. Prodr., p. 13 (1794), found by THUNBERG near "Zekorivier" as labelled on the back of the sheet, is no Cucurbitacea at all, but has been identified as a *Senecio sp.* (Comp.)

ERICACEAE. The Cape heaths in the THUNBERG Herbarium are very numerous and undoubtedly provide most valuable material for investigation. They have been revised by RACH, as appears from the notes on the sheets. From THUNBERG's specimens we selected for reproduction *Erica cerinthoides*, L. (*vide* Plate VII.). This species, a large-flowered one, has been described by THUNBERG in his Diss. Erica, p. 25 (1785). There are three sheets of it, numbered α, β, and γ. Only the specimen on sheet α, of which accompanying photograph has been made, belongs to *E. cerinthoides*, the sheets β and γ respectively contain specimens of *E. erubescens*, Andr. and *E. elongata*, Lodd. (RACH!). Sheet α is labelled on the back "e Cap b. spei Thunberg."

E. cerinthoides is a very showy plant with its large, red, urnshaped flowers which are covered with red hairs on the outer side of the corolla, to which feature the plant derived the pretty common names "Red hairy heath" and "Rooihaartjie." As to its habitat we found this species on the mountain-slopes near Simonstown (Cape).

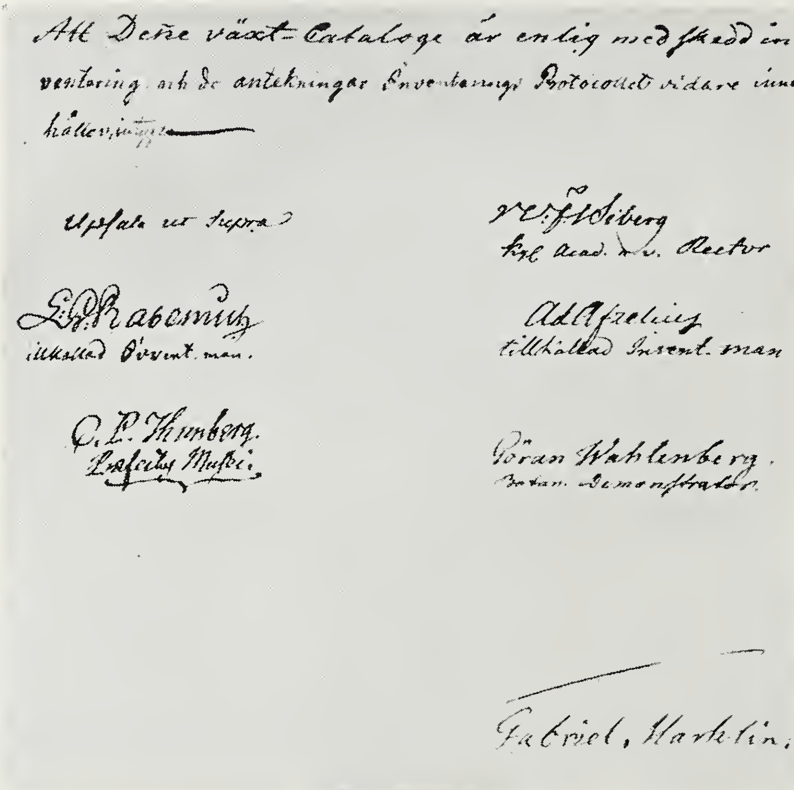
SCROPHULARIACEAE. The genus "Antirrhinum" as represented in the THUNBERG Herbarium contains but S. African species, all belonging to the genus *Nemesia*, with exception of A. longicorne, Thunb. Prodr., p. 105 (1800), which is identical with *Diascia Thunbergiana*, Spreng.; and A. aphyllum, L.f. Suppl., p. 280 ("Thunb.") (1781), a very distinct species, which has been identified as a kind of "Bladderwort", *Utricularia Ecklonii*, Spreng. (Lentibulariaceae).



Göran Wahlenberg (1780-1851).
Medicinae Doctor and Thunberg's successor as a Professor of Botany at Uppsala University.
After a photograph by A. Dahlgren of an oil-painting in the house of the students of "Värmlands Nation" at Uppsala. Reproduced from: Acta Horti Bergiani, Bd. III, No. 3 (1905), Tab. 45.

The Institute of Systematic Botany at Uppsala (tho former Botanical Institute)
Photo Almquist & Cöster, Hälsingborg.

Plate IV.


Att Dette växt-Catalogue är enlig med skedd inventering och de anteckningar Inventerings Protocollet vidare innehåller, intygar

Upsala ut supra

L. A. Rabenius
tillkallad Invent. man.

C. P. Thunberg.
Praefectus Musei.

Kgl. Acad. ... Rector

Ad. Afzelius
tillkallad Invent. man

Göran Wahlenberg.
Botan. Demonstrator.

Gabriel Marklin.

Official statement at the back of each volume of WAHLENBERG's catalogue of the Herbarium Thunbergianum.

PLATE V.

Herbarium Thunbergianum.
Protea cynaroides, L. Photo Carl G. Alm.

Herbarium Thunbergianum.
Ixia viridiflora, Lam. (I. viridis β). Photo Carl G. Alm.

PLATE VI.

Herbarium Thunbergianum.
Satyrium carneum, R. Br. (S. cucullatum δ). Photo Carl G. Alm.

Herbarium Thunbergianum.
Erica cerinthoides, L. Photo Carl G. Alm.

PLATE VII.

CARL PETER THUNBERG.

AN EARLY INVESTIGATOR OF CAPE BOTANY.

Part V*

(With Plate VIII).

By Mia C. Karsten.

THUNBERG'S LITERARY CONTRIBUTIONS TOWARDS THE KNOWLEDGE OF CAPE BOTANY.

Back at Uppsala from his 9 years journey, Thunberg plunged into the study and arrangement of his extensive collections with the utmost assiduity. We have already recorded that in 1785 his complete collections of *naturalia* were presented to Uppsala University.

Certainly Thunberg had made the most of his 3 years residence at the Cape, and his botanical exploration of that region could hardly have been more fruitful. The thoroughness of his research cannot be better illustrated than by the following statement quoted from MacOwan's paper[211]: "The painstaking completeness of Thunberg's research is significantly shown by the fact that not a few remarkable plants found and described by him a century ago escaped the researches of both Ecklon and Zeyher, who beat over the ground for thirty years, and of Drège, who completes the lynx-eyed trio of collectors."

The material he brought home or already sent to Europe during his stay in that southernmost corner of Africa greatly exceeded his collections of Cingalese, Javanese and Japanese plants. In this connection it is by no means surprising that the greater part of his publications are entirely or at least partially devoted to Cape plants, and when we notice the long list of his botanical contributions as given in Juel's "Plantae Thunbergianae," we cannot but have the greatest admiration for Thunberg's scientific ability and extraordinary energy, his literary inheritance being amazing.

* The concluding part of the series, of which parts I, II and III were published in the Journal, Vol. V (1939), pp. 1, 87, 105, and part IV in Vol. XIII 1947 p 127.

[211] Peter MacOwan, "Personalia of Botanical Collectors at the Cape," Transact. S. Afr. Phil. Soc., Vol. IV, 1887. New edition (Verduyn den Boer) 1929, p. 36.

His extensive collections of Cape plants comprise more than 3,000 species, over 1,000 of which not having been discovered before. Moreover THUNBERG is the author of no less than 74 genera nova, all of them described in his "Genera nova plantarum," though a number of these have been withdrawn later on; 48 genera have been established on Cape plants, of which 28 are still valid to-day.

A summary of THUNBERG's genera of Cape plants may be of interest. The valid names are printed in italics. To most of the genera the type species have been added under the names as given by THUNBERG, followed by the valid names in modern botany, if the former names have not been retained.

Acharia 1794. (Passifl.). *A. tragodes*, Thunb. !

Aitonia 1781=*Nymania*, Lindb. (Sapind.). A monotypic genus. Aitonia capensis, Thunb.=*Nymania capensis*, (Thunb.) Lindb., now classified with the Meliaceae.

Alectra 1784=*Melasma*, Berg. 1767. (Scroph.). Alectra capensis, Thunb.=*Melasma capense*, (Thunb.) Hiern. !

Augea 1794. (Zygophyll.). *A. capensis*, Thunb. !

Boscia 1794=*Toddalia*, Juss. 1789. (Rutaceae). B. undulata, Thunb.= *Toddalia lanceolata*, Lam. !

Calodendrum 1782 (later spelled Calodendron). (Rutaceae). *C. capense*, (L.f.) Thunb. !

Caroxylon 1782=*Salsola*, L. (Chenopod.). C. salsola, Thunb.=*Salsola aphylla*, L. !

Cavanilla, *Thunb.* 1794 (non Gmel. 1791)=*Pyrenacantha*, Wight 1831. (Rosac.). C. scandens, Thunb.=*Pyrenacantha scandens*, (Thunb.) Planch. !

Chamira 1782. (Crucif.). *C. cornuta*, Thunb. !

Chenolea 1781. (Chenopod.). *C. diffusa*, Thunb. !

Choristea 1800=*Didelta*, L'Hérit. 1785. (Comp.). Ch. carnosa, (L.f.) Thunb.=*Didelta carnosum*, (L.f.) Ait. ! Ch. spinosa, (L.f.) Thunb. =*Didelta spinosum*, (L.f.) Ait. !

Cussonia 1780. (Aral.). *C. spicata*, Thunb. ! *C. thyrsiflora*, Thunb. !

Dahlia, *Thunb.* 1792 (non Cav. 1791 !)=*Trichocladus*, Pers. 1807. (Hamamelid.). D. crinita, Thunb.=*Trichocladus crinitus*, (Thunb.) Pers. !

Denekia, Thunb. 1800. (Comp.). *D. capensis*, Thunb. !

Doria 1800=*Senecio*, L. partially (several species having been separated from this genus and placed under the genera *Cineraria* and *Othonna*). (Comp.).

Ehrharta 1779. (Gramineae). *E. capensis*, Thunb. !

Fabricia, *Thunb.* 1779 (non Adans. 1763)=*Hypoxis*, L. partially (several species having been separated from this genus and placed under the genera *Janthe* and *Forbesia*). (Amaryll.).

Falckia 1781. (Convolv.). Convolvulus Falckia, Thunb. 1794=*Falckia repens*, Thunb. 1781.

Galaxia 1782. (Irid.). *G. ovata*, Thunb. et Andrews !

Hallia 1799. (Legum.). Many species.

Hydnora 1775, a monotypic genus. (Hydnoraceae). *H. africana*, Thunb.

Hypocalyptus 1800. (Legum.). *H. canescens*, Thunb. ! Further including several species of *Podalyria*, i.a. H. calyptratus, Thunb.=*Podalyria calyptrata*, (Thunb.) Willd., the "keurtjie."—H. capensis, (L.) Thunb.=*Virgilia capensis*, (L.) Lam., the "keurboom."

Lapeirousia 1800=*Peyrousea*, DC. 1837. (Comp.). L. calycina, (L.f.) Thunb.=*Peyrousea calycina*, (L.f.) DC. !

Laurophyllus 1792=*Botryceras*, Willd. 1811. (Anacard.). L. capensis, Thunb.=*Botryceras laurinum*, Willd.

Lebeckia 1800. (Legum.). A few species have been separated and included in the genera *Eremosparton* (doubtful spec.), *Wiborgia*, *Aspalathus*.

Massonia, Thunb. apud L.f. 1781. (Liliac.).

Mertensia, Thunb. apud Roth 1807=*Champia*, Desv. 1808. (Algae). M. lumbricalis, Thunb.=Ulva lumbricalis, L.=*Champia lumbricalis*, (L.) Lamour !

Montinia 1777. (Saxifr.). *M. caryophyllacea*, Thunb. !

Oedmannia 1800=*Rafnia*, Thunb. 1800. (Legum.). O. lancea, Thunb. =*Rafnia lancea*, (Thunb.) DC. !

Olinia 1799. (Oliniaceae). *O. cymosa*, (L.f.) Thunb. !

Papiria 1777.=*Gethyllis*, L. (Amaryll.); *i.a.* P. ciliaris, Thunb.=*Gethyllis ciliaris*, Thunb. 1781; P. lanceolata, Thunb.=Gethyllis lanceolata, Thunb. 1781=*Apodolirion lanceolatum*, (Thunb.) Benth. et Hook.; P. spiralis, Thunb.=*Gethyllis spiralis*, Thunb. 1781; P. villosa, Thunb.=*Gethyllis villosa*, Thunb. 1781.

Pentzia 1800. (Comp.). *P. crenata*, Thunb. !

Phelypaea, *Thunb.* 1784 (non L.)=*Cytinus*, L. (Rafflesiaceae). Ph. sanguinea, Thunb.=*Cytinus dioicus*, Juss. !

Rafnia 1800. (Legum.). Many species with THUNBERG as authority.

Retzia 1776. (Solanac.). *R. capensis*, Thunb. !

Roemeria (genus spurium) 1798. (Anacard.). R. argentea, Thunb.= *Anaphrenium argenteum*, (Thunb.) E. Mey. !

Rosenia, Thunb. 1800. (Comp.) *R. glandulosa*, Thunb. !

Rothmannia 1776=*Gardenia*, Ellis 1761. (Rubiac.). R. capensis, Thunb.=*Gardenia Rothmannia*, Thunb. 1780.

Sanseviera 1794 (also spelled Sansevieria). (Liliac.). S. aethiopica, Thunb.=*S. zeylanica*, (Jacq.) Willd.

Sarcophyllus 1799=*Aspalathus*, L. (Legum.). S. carnosus, Thunb.= *Aspalathus sarcodes*, Vog. (Walp. according to HARVEY).

Stobaea 1800=*Berkheya*, Ehrh. 1788. (Comp.). Many species.

Toxicodendrum 1796. (later spelled Toxicodendron). (Euphorb.). *T. capense*, Thunb. !

Vahlia 1782. (Saxifr.). *V. capensis*, (L.f.) Thunb. !

Wiborgia 1800. (Legum.). In THUNBERG'S herbarium 3 species, all of them with THUNBERG as authority.

Willdenowia 1790. (Also spelled Wildenowia). (Restion.). A few species, one of them having later been included in the gen. *Cannamois*.

Witsenia 1782 (or Witsena). (Irid.). A few species, including one species of *Nivenia*. Witsena maura, Thunb.=*Witsenia maura*, (L.) Thunb.!

Wurmbea 1781. (Liliac.). *W. capensis*, Thunb. !

Zuccagnia 1798=*Dipcadi*, Medic. 1790. (Liliac.). Z. viridis, (L.) Thunb. =*Dipcadi filamentosum*, Medic.

Proceeding to his publications on Cape plants, his "Flora Capensis" may be introduced as his best known work, and being the first more extensive treatment of the Cape vegetation, it certainly may be praised as a meritorious piece of work, though we know that THUNBERG was not able to complete the work himself. On the other hand THUNBERG has fixed his vast store of botanical observations in a great number of monographs in the form of academical dissertations and this undoubtedly is the reason that his preparatory work for the "Flora Capensis" was held up. It was not, however, the first Cape flora that made its bow to the botanical world, for this honour is due to CAROLUS LINNAEUS' "Flora Capensis" (1759)[212], a nineteen pages booklet containing a short enumeration of the animals, a very brief account of the climate and the cultivated plants which have been introduced from Europe and Asia, some interesting notes on the collectors HERMANN, OLDENLAND, HARTOG, followed by a list of no less than 503 species of Cape plants, belonging to 174 genera. It is a mere catalogue of plants, no descriptions being given. Nearly all Proteaceae are included in the genus *Leucadendron*, and there are only two species of *Protea*, viz. *P. argentea* (*Leucadendron argenteum*, R. Br. !) and *P. fusca*. As to the other plants we counted *inter alia* 11 species of *Crassula* and no less than 40 *Mesembryanthemums*, but we found the orchids missing. This florula appeared as an academical dissertation

[212] C. H. WANNMAN. *Flora Capensis* (Sub Praesidio D. D. CAROLI LINNAEI).— Amoenitates Academicae V, pp. 353-370.—Upsaliae, 1759.

under the name of Carolus Henr. Wännman, but must be ascribed to Linnaeus. It is P. J. Bergius' " Descriptiones Plantarum ex Capite Bonae Spei " (1767)[213] that may be regarded as a first serious attempt to produce a flora of the Cape. This book numbering 368 pages, contains 5 plates depicting 10 species of Cape plants. These illustrations are not exactly true to life, the artist having evidently drawn the figures from dried specimens. The Latin descriptions Bergius gives of the plants which he received from Michael Grubb and which originally were Auge's collecting, are very full and adequate. But also this work on the Cape flora is far from being complete. So we found the important genus *Mesembryanthemum* missing and the few species of *Protea* known to Bergius included in the gen. *Leucadendron*. However, in view of the very superficial knowledge of the Cape vegetation at the time this work was written—Thunberg's botanical exploration of the country was far more extensive than that of any earlier traveller—we may pay tribute to Prof. Bergius for this publication that surely deserves our appreciation as the first *descriptive* flora of the Cape.

As to the compilation of Thunberg's " Flora Capensis " which proceeded very slowly, the following information may be quoted from Juel.

Thunberg originally intended to publish a work on the Cape flora that would be illustrated just like his " Flora Iaponica." To that end he made an arrangement with a Berlin publisher. However, he found it suitable after all to confine himself for the time being to a short summary of the work. So his " Prodromus Plantarum Capensium " was born, which appeared in two volumes in the years 1794 and 1800 and comprised the whole system, though with only very short diagnoses, so that it is little more than a descriptive catalogue of the briefest kind. A photograph of the title-page of Vol. I, Upsaliae, 1794 is here reproduced (*vide* Plate VIII). In this " Prodromus " the diagnoses of the species of the monotypic genera are missing, these having been included in the diagnoses of the genera which had been published earlier in his " Novorum generum characteres essentiales," but unfortunately without quoting the pages. Nearly the whole contents of the " Prodromus " one may find unchanged in the " Flora Capensis " which came out later. But in the " Flora Capensis " the genera *Toxicodendron* and *Capraria* are missing, and so are all species of *Borbonia* as described in the " Prodromus."

The preparation of the " Flora Capensis " took a much longer time than that of his " Flora Iaponica " (1784), the collected material not only

[213] P. J. Bergius, *Descriptiones Plantarum ex Capite Bonae Spei*, cum differentiis specificis, nominibus trivialibus, et synonymis auctorum justis. Secundum systema sexuale. Cum Tabulis aeneis.—Stockholmiae, 1767.

being much larger, but also the Cape vegetation being characterized by a great number of very large and difficult genera.

The Berlin edition of the Cape flora never appeared, but the work was printed at Uppsala in a more modest form without plates. The first fascicle, of which the title-page is reproduced herewith (*vide* Plate VIII) came out in 1807, the second in 1811, the third in 1813; with this last part the first volume with the first four classes was concluded. For some reason this edition was not continued, for the second volume was printed at Copenhagen (Hafniae) in two fascicles comprising the 5th and 6th classes, which came out in 1818 and 1820 respectively. This Copenhagen edition was badly edited with many misprints and this edition too was not continued. At that time THUNBERG was already an old man and he probably felt that this task exceeded his strength, so he left the work to the botanist Dr. J. A. SCHULTES at Stuttgart, who ultimately edited it from the author's manuscript in 1823.

THUNBERG published monographs of numerous genera of Cape plants in various periodicals at home and abroad or as separate dissertations. During the time that he completed his "Flora Iaponica," an undertaking that he achieved within 5 years—the work was published in 1784—he produced various publications on Cape plants, including monographs of some larger genera like *Protea*, *Oxalis*, *Iris* (=*Morea*, etc., see below), *Ixia*, *Gladiolus*.

No less than 293 academic dissertations (Dissertationes academicae Vpsaliae habitae sub praesidio C. P. THUNBERG, edited by C. H. PERSOON), several of them dealing with Cape genera and many of them bearing on the title-page the names of his pupils, as whose *orationes doctae* they seem to have appeared, have been published in two volumes at Göttingen in 1799 and 1800. But there is some reason to assume that THUNBERG himself had the authorship of many of the papers published under his direction[214].

In the Transactions of that old and worthy institution, the Kungl. Vetenskapsakademien (Royal Academy of Science) at Stockholm we find a series of papers written by THUNBERG on Cape plants and animals.

We have already mentioned his "Beskrifning på en ganska besynnerlig och obekant svamp, *Hydnora africana*, ifrån Goda hupps udden" (Kongl. Vetenskaps Academiens Handlingar, Vol. 36, tab. II, 1775[215]), containing a description of that curious parasitic plant which is introduced by him as

[214] *Vide* PETER MACOWAN, "Personalia of Botanical Collectors at the Cape," Transact. S. Afr. Phil. Soc., Vol. IV, 1887. New edition (VERDUYN DEN BOER) 1929.

[215] See also C. P. Thunberg III, Journal of S. Afr. Botany, Vol. V, Part IV, Oct. 1939, pp. 150-151; the title of this publication which we examined in the Academy's library, slightly differs from that given in JUEL's "Plantae Thunbergianae," for in the latter it reads: "Beskrifning . . . . ifrån Goda *Hoppets* udde."

" a most peculiar and unknown fungus." From this paper the following may be quoted here : " But of all that I have so far had the opportunity to see and discover, nothing has appeared to me more strange than the Fungus whose description I now have the honour of submitting. So strange is its structure that many people would certainly doubt the existence of such a plant on the face of the earth."[216] SVEDELIUS in his Thunberg biography[217] adds to this that the plant referred to appeared to THUNBERG neither a true fungus nor yet classifiable with the flowering plants. It resembled both the Orobanche and the fungi. Later on, however, the *Hydnora* was found to be a phanerogamous plant allied to the Rafflesiaceae and Aristolochiaceae. Just like the latter it has a decidedly protogynous, entomophilous flower where the pollinating insects are imprisoned some little time while the stamens ripen their pollen.

As to its habitat the article reveals that THUNBERG discovered this plant in the " Båckefälts bergen " (Bokkeveld mountains).

Some additional notes on *Hydnora africana*, Thunb. were published by THUNBERG in the K. Vet. Acad. Handlingar of 1777 and 1808.

Another of THUNBERG'S papers published in the Academy's Transactions deals with that very poisonous Euphorbiacea *Toxicodendron capense*, Thunb. The article is entitled " Gifträdet på Goda hopps udden, Toxicodendrum, kalladt och beskrifvet " (A Poison-tree of the Cape of Good Hope, named and described (as) Toxicodendrum), Kongl. Vetensk. Acad. Handlingar, Vol. XVII, tab. VI, 1796. The following quotation from this old paper provides interesting reading[218] :

" During my 3 years journeys from South Africa's extremity into the interior, the Dutch colonists often talked about the poison by means of of which wolves, hyaenas and other beasts can be killed just like it is done with nux-vomica, if it is mixed with meat of some carrion. My efforts

[216] Original Swedish text : " Men bland allt det, som jag hittills haft tillfälle att se och upptäcka, har dock ingenting förekommit mig mera undransvärt, än den Svamp, vars beskrivning jag nu har äran överlämna. Den är till sin sammansättning så besynnerlig, att mången skulle säkerligen tvivla, att en dylik växt gives på jordklotet."

[217] NILS SVEDELIUS, " Carl Peter Thunberg 1743-1828," Svenska Linné-Sällskapets Årsskrift, Argang XXVII (1944), p. 41. *ibid.*, " C. P. Thunberg on his Bicentenary," in the American journal Isis, Vol. XXXV, Part 2, No. 100, Spring, 1944, pp. 130-131.

[218] Original Swedish text : " Under mine tre-årige Resor uti de inre Landskap af det Södra Africas hörn, taltes ej sällan utaf Hollandske Nybyggare om et Förgift, hvarmed Wargar, Hyaena och andre Raf-djur, likasom med Räf-kakor, kunde dödas, då det inblandades uti köttet af något Luder.

Mine bemödanden at uptäcka en frukt af denna egenskap förvissade mig, at uti nagre orter nyttjades Fröhusen utaf någon stor Euphorbia, hvilkets hela slägte altid varit ärkändt för giftigt. Men tilleka ärhöll jag en annan frukt, som väl mycket liknade Euphorbia, men tyckte sig skilja sig något derifrån.

Denna Frukt var hård, öppnade sig småningom i kanterne och innehöll trenne rum, gifvande tillkänna sin slägtskap med Triacocca och i följe deras sin giftige natur."

to discover the fruit which possessed that property, gave me the conviction that in some places the capsules of some large Euphorbia are used, whose entire genus is always acknowledged to be poisonous. However, at the same time I received another fruit that much resembled a Euphorbia, but somewhat differed from it. This fruit was hard, opened gradually at the edges and contained three cells, making itself known as allied to Triacocca and consequently having its poisonous nature."

Further we came across a description of a new species of *Gladiolus*, viz. " Gladiolus Sparrmanni, ett nytt Species, beskrifvet " (K. Vet. Acad. Handl. för 1814. Tab. IX). According to the late Dr. N. E. Brown this species belongs to the genus *Freesia* and it was consequently renamed *Freesia Sparrmanii*, (Thunb.) N. E. Br.

Dr. Felix Bryk of the Entomological Department of the State Museum for Natural History (Naturhistoriska Riksmuseum) at Stockholm kindly called our attention to the little known fact that Thunberg like his master Carolus Linnaeus was a great zoologist too, but that this part of Thunberg's investigations has been rather stepmotherly treated so far. We will therefore quote three of Thunberg's zoological papers which may be of interest to our S. African readers. In the K. Vet. Acad. Handlingar of 1784 an article was published bearing the title : " Anmärkningar om några foglar af *Loxiae* slägte på Goda hopps udden" (Notes on some birds of the genus *Loxia* from the Cape of Good Hope). In this paper Thunberg tells us that *Loxia caffra* is the most curious of all because of its long tail and that this characteristic causes the colonists to call the same " langstaartvogel." Further it is recorded that this bird is found far away from Capetown, about 200 miles inland to the Northwest, near Zeekoe river and as far as Swartkops river.

The other two publications are " Beskrifning på tvenne nya insektslägten, Gnatocerus och Taumacera ifrån Goda hopps udden" (Description of two new genera of insects, Gnatocerus and Taumacera from the Cape of Good Hope), K. Vet. Acad. Handl., 1814) and " Beskrifning och teckning på ett nytt species, Hyaena brunnea" [Description and picture of a new species (of the gen. Hyaena), H. brunnea], published in the K. Vet. Acad. Handlingar of 1820.

The catalogue Thunberg made of the collections he presented to the University of Uppsala and which was gradually enlarged with his new acquisitions, provided material for 61 dissertations which were defended under his direction and published under the heading " Museum naturalium Academiae Upsaliensis." The new acquisitions of his herbarium from 1797-1819 were listed in a long series of " Appendices." Needless to say, of the many species of plants dealt with in this serial publication, a certain number originated from the Cape.

We have already dealt at great length with THUNBERG's "Resa" (Travels), a 4 vols. itinerary which surely may be classed among the most noteworthy works he left. We know that the original Swedish edition was published in 1788-93, and that this was speedily followed up by German, English and French translations. The wealth of botanical records collected in this work and, not least, the many notes about the habitat of the plants mentioned or described, does impart it a certain scientific value also from a plant-geographical point of view.

Finally we may put forward as THUNBERG's co-operators in the scientific arrangement of his collections of plants his fellow-countrymen LINNAEUS the younger[219]; O. SWARTZ, who described some of his orchids, Pteridophyta and Bryophyta; and E. ACHARIUS, who described several of his new species of Algae and probably identified his entire collection of these lower plants.

Annotated list of publications in chronological order by C. P. Thunberg on Cape plants or partially dealing with Cape botany.

Cycas caffra, nova Palmae species descripta. Nova Acta Regiae Societatis scientiarum Upsaliensis, Vol. II, tab. V (1775).

Cycas caffra, Thunb.=*Encephalartos caffer*, (Thunb.) Miq.

Beskrifning på en ganska besynnerlig och obekant svamp, *Hydnora africana*, ifrån Goda hupps udden. Kongl. Vetenskaps Academiens Handlingar, Stockholm, Vol. 36, tab. II (1775). (Transl.: Description of a most peculiar and unknown fungus, *Hydn. africana*, from the Cape of Good Hope).

Rothmannia, et nytt Örte-genus; funnet och beskrifvit. Ibidem, Vol. 37, tab. II (1776).—(Transl.: R., a new genus of plants; found and described).

(Rothmannia, Thunb.=*Gardenia*, Ellis).

Retzia capensis, et nytt Ört-slag, funnit och beskrifvit. Physiographiska Sälskapets Handlingar, Stockholm, Vol. I: 1, tab. I, fig. 2 (1776). This Society is established at Lund, its transactions being often quoted as "Acta Lundensia."—(Transl.: R. capensis, a new genus of plants, found and described).

Montinia och Papiria, tvänne nya Örtslag fran Goda Hopps Udden, beskrifne. Ibidem, Vol. I: 2 (1777). The 2nd part of this vol. had left the press towards the end of 1777.—(Transl.: M. and P., two new genera of plants described, from the Cape of Good Hope).

(Papiria, Thunb.=*Gethyllis*, L.).

[219] *Vide* second part of this work (Journal of S. Afr. Botany, Vol. V, Part II, July 1939, pp. 102-3).

Beskrifning, på hvad Sätt, som Aloës Kåda uti Africa tilredes. Ibid., Vol. I : 2 (1777).—(Transl. : Description of the way in which Aloe-resin is prepared in Africa).

Anmärkningar vid Hydnora africana. K. Vet. Acad. Handl., Stockholm, Vol. 38, tab. IV (1777).—(Transl. : Observations on H. afr.).

Observatio LXVIII sistens Crassulae generis XXVIII Novas species in Capite bonae spei detectas et descriptas. Nova Acta phys.-med. Acad. Caesar. Leop.-Carol. naturae curiosorum, Norimbergae, Vol. VI (1778).

Et til sit slägte nytt och tilförene obekant Gräs, kalladt Ehrharta. K. Vet. Acad. Handl., Stockholm, Vol. 40 (1779).—(Transl. : A new grass of its genus and hitherto unknown, named E.).

Cussonia, novum plantae genus e Promontorio Bonae Spei Africes descriptum. N. Act. R. Soc. Scient. Upsal., Vol. III, tab. XII, XIII (1780).

Dissertatio botanica de Gardenia. Upsaliae. Tab. I, II (1780).
Reprints : in Acta medicorum suecicorum, Vol. I (1783), p. 131, tab. XI, XII ; in Diss. acad. Vpsaliae, etc., Vol. II, Gottingae 1800, tab. I, II.

Dissertatio botanica de Protea. Upsaliae. Tab. I-V (1781). (Incl. species of *Leucadendron. Leucospermum, Mimetes, Aulax, Serruria,* etc.).
Reprints : in Acta medic. suec., Vol. I (1783), p. 1, tab. I-V ; in Diss. acad. Vpsåliae, etc., Vol. II, Gottingae 1800, without tab.

Oxalis. (Dissertatio botanica de Oxalide). Upsaliae, Tab. I, II (1781).
Reprints : In Acta medic. suec., Vol. I (1783), p. 69, tab. VI, VII ; in Diss. acad. Vpsaliae, etc., Vol. II, Gottingae 1800, without tab.

Nova genera plantarum. Part. I. (Diss.). Upsaliae. Tab. (1781).
Reprints : in Acta medic. suec., Vol. I (1783), p. 207, tab. XVI ; in Diss. acad. Vpsaliae, etc., Vol. I, Gottingae 1799, tab. I.

Aitonia capensis. Physiogr. Sälsk. Handl., Stockholm, Vol. I : 3, tab. III (1781). (From the protocol of the Society of May 2, 1781 it is recorded that this part came from the press in that year).

Beschrijving van twee nieuwe Soorten van Palmboomachtige Gewassen, uit Japan en van de Kaap der Goede Hope ; met eenige Aanmerkingen omtrent de Bloemen van de Varens en dergelijke planten. Verhandelingen Hollandsche Maatschappij der Wetenschappen, Haarlem, Vol. XX : 2 (1782).—(Transl. : Description of two new Species of Palm-treelike Plants, from Japan and the Cape of Good Hope ; with some Observations on the Flowers of the Ferns and similar plants).

See also Carl Peter Thunberg III (Travels), Journal of S. Afr. Botany, Vol. V, Part III, Oct., 1939, p. 126, footnote 99.

Iris. (Diss. botanica de Iride). Upsaliae. Tab. I, II (1782). (=Species of *Morea*, *Homeria*, etc.).

Reprint : in Diss. acad. Vpsaliae, etc., Vol. II, Gottingae 1800, without tab.

Nova genera plantarum. Part. II. (Diss.). Upsaliae. Tab. (1782).

Reprints : in Act. medic. suec., Vol. I (1783), p. 234, tab. XVII ; in Diss. acad. Vpsaliae, etc., Vol. I, Gottingae 1799, tab. II.

Descriptio generis Dilatris dicti. Schrift. Berlin. Gesellsch. naturf. Freunde, Vol. IV (1783).

Ixia. (Dissertatio botanica de Ixia). Upsaliae. Tab. (1-2) (1783). (Incl. species of *Geissorhiza*, *Sparaxis*, *Romulea*, *Lapeyrousia*, *Tritonia*, etc.).

Reprint : in Diss. acad. Vpsaliae, etc., Vol. II, Gottingae 1800, without tab.

Nova genera plantarum, Part. III. (Diss.). Upsaliae. Tab. (1783).

Reprint : in Diss. acad. Vpsaliae, etc., Vol. I, Gottingae 1799, tab. III.

Nova genera plantarum, Part. IV. (Diss.). Upsaliae. Tab. (1784).

Reprint : in Diss. acad. Vpsaliae, etc., Vol. I, Gottingae 1799, tab. IV.

Nova genera plantarum. Part. V. (Diss.). Upsaliae. Tab. (1784).

Reprint : in Diss. acad. Vpsaliae, etc., Vol. I, Gottingae 1799, tab. V.

Gladiolus. (Dissertatio botanica de Gladiolo). Upsaliae. Tab. I, II (1784). (Incl. species of *Lapeyrousia*, *Romulea*, *Tritonia*, *Watsonia*, *Babiana*, *Hesperantha*, etc.).

Reprint : in Diss. acad. Vpsaliae, etc., Vol. II, Gottingae 1800, without tab.

Dissertatio botanico-medica de Aloë. Upsaliae. (1785).

Reprint : in Diss. acad. Vpsaliae, etc., Vol. II, Gottingae 1800.

Dissertatio botanica de Erica. Upsaliae. Tab. I-VI. (1785).

Reprints : in Usteri, Delectus opusculorum botanicorum, Vol. II,, Argentorati 1793, p. 1, without tab. ; in Diss. acad. Vpsaliae, etc., Vol. II, Gottingae 1800, without tab. ; Editio altera cur. R. A. Salisbury, Featherstone 1800, without the original plates, with one pl. by Salisb.

Anmärkningar och beskrifning på Albucae Örteslägte. K. Vet. Acad. Nya Handl., Stockholm, Vol. VII, tab. II, fig. 1 (1786).—(Transl. : Notes and description of the botanical genus (literally : genus of plants) of *Albuca*).

Ficus genus. (Diss.). Upsaliae. Tab. (1786).

Reprints : in Usteri, Delect. opusc. botan., Vol. I, Argent. 1790, p. 125, tab. V ; in Diss. acad. Vpsaliae, etc., Vol. II, Gottingae 1800, without tab.

Beskrifning på et nytt Slägte uti Ört-riket, kalladt Falckia. Physiogr. Sälsk. Handl., Stockholm, Vol. I : 4, tab. IV, fig. 3 (1786).—(Transl. : Description of a new genus of the vegetable kingdom, called Falckia).

Dissertatio botanica de Moraea. Upsaliae. Tab. I, II (1787). (Incl. species of *Aristea*, *Bobartia*, *Homeria*, *Hexaglottis*, etc.).

Reprint : in Diss. acad. Vpsaliae, etc., Vol. II, Gottingae 1800, without tab.

Restio. (Diss.). Upsaliae. Tab. (1788). (Incl. species of *Thamnochortus*, *Elegia*, *Dovea*, etc.).

Reprints : in Usteri, Delect. opusc. botan., Vol. I, Argent. 1790, p. 35, tab. II ; in Diss. acad. Vpsaliae, etc., Vol. II, Gottingae 1800, without tab.

Resa uti Europa, Africa, Asia, förrättad åren 1770-1779. Upsala. 1 : a Del. 1788 ; 2:a Del. 1789 ; 3:e Del. 1791 ; 4:e Del. 1793.—(Transl. : Travels in Europe, Africa, Asia, performed in the years 1770-1779).

Translations in German, English and French : Reise durch einen Theil von Europa, Afrika und Asien, hauptsächlich in Japan, in den Jahren 1770-1779. Aus dem Schwed. von Grosskurd. Berlin I, II, 1792-94.

Reisen in Afrika und Asien, vorzüglich in Japan, während der Jahre 1772 : 1779 auszugsweise übersetzt von K. Sprengel. Berlin 1792.

Travels in Europe, Africa and Asia. I-IV. London, 1794-95.

Voyages de C. P. Thunberg au Japon, par le Cap de Bonne-Espérance, des îles de la Sonde, etc. Trad. par L. Langlès et revus quant à la partie d'histoire naturelle par J. B. Lamarck. I-IV. Paris 1796.

Voyage en Afrique et en Asie, principalement au Japon, pendant les années 1770-1779, servant de suite au voyage de Sparrman. Paris 1794.

Beskrifning på Wildenowia, et synnerligt och nytt Gräs-Slag. K. Vet. Acad. Nya Handl., Stockholm, Vol. XI, tab. II (1790).—(Transl. : Description of Wildenowia, a peculiar and new genus of grasses). (Incl. sp. of *Cannamois*).

Descriptiones Mesembryanthemorum quorundam in Capitis bonae spei Africes interioris regionibus anno MDCCLXXIV detectorum. N. Act. phys.-med. Caesar. Leop.-Carol. naturae curios., Norimbergae, Vol. VIII (1791).

Museum naturalium Academiae Upsaliensis. Part. IX, X. Donationis Thunbergianae continuat. (Diss.). Upsaliae (1791). (Comprises the Classes I-IV).

Beskrivelse over en ny og tilforn ubekiendt Plante-Slaegt Dahlia crinita kaldet. Skrivter av Naturhistorie-Selskabet, Köbenhavn, Vol. II : 1, tab. 4 (1792).—(Transl. : Description of a new and hitherto unknown genus of plants, named Dahlia crinita).

(Dahlia crinita, Thunb.=*Trichocladus crinitus*, (Thunb.) Pers.)

Genera nova plantarum. Part VI, VII. (Diss.). Upsaliae (1792).

Reprint : in Diss. acad. Vpsaliae, etc., Vol. I, Gottingae 1799.

Museum naturalium Academiae Upsaliensis. Part XI-XIII. (Diss.). Upsaliae (1792). (Classes V-IX).

Afhandling og Beskrivelse over nogle tilforn ubekiendte Arter af Rohria. Skrivt. Naturh. Selsk. Köbenhavn, Vol. III: 1, tab. VI-XIII (1793).—(Transl.: Treatise and description of some hitherto unknown species of Rohria).
(=species of *Berkheya*, *Cullumia*, *Stephanocoma*).

Museum naturalium Academiae Upsaliensis. Part XIV. (Diss.). Upsaliae (1793). (Classis X).

Prodromus Plantarum Capensium, quas, in Promontorio Bonae Spei Africes, annis 1772-1775, collegit. Pars prior. Upsaliae, Tab. (1-3) (1794). (Classes I-X).

Beskrifning på Örteslägtet Cyanella. K. Vet. Acad. Nya Handl., Stockholm, Vol. XV, tab. VII (1794).—(Transl.: Description of the plant genus *Cyanella*).

Dissertatio botanica de Hermannia. Upsaliae. Tab. (1794). (Incl. species of *Mahernia*).
Reprint: in Diss. acad. Vpsaliae, etc., Vol. II, Gottingae 1800, without tab.

Museum naturalium Academiae Upsaliensis. Part XV-XVIII. (Diss.). Upsaliae (1794). (Classes XI-XV.).

Giftträdet på Goda hopps udden, Toxicodendrum kalladt och beskrifvet. K. Vet. Acad. Handl., Stockholm, Vol. XVII, tab. VI (1796).—(Transl.: A Poison-tree of the Cape of Good Hope, named and described (as) Toxicodendrum).

Museum naturalium Academiae Upsaliensis, Part. XIX, XX. (Diss.). Upsaliae. (1796). (Classes XVI-XVIII).

Dissertatio botanica de Diosma. Upsaliae (1797).
(Incl. species of *Barosma*, *Agathosma*, *Coleonema*, *Macrostylis*, *Adenandra*, *Empleurum* and two Bruniaceae: *Audouinia* and *Linconia*).
Reprint: in Diss. acad. Vpsaliae, etc., Vol. II, Gottingae 1800.

Dissertatio botanica de Drosera. (Upsaliae 1797).
(Incl. *Roridula*).
Reprint: in Diss. acad. Vpsaliae, etc., Vol. II, Gottingae 1800.

Museum naturalium Academiae Upsaliensis. Part XXI, XXII. (Diss.). Upsaliae (1797). (Classes XIX, XXIV).

Museum naturalium Academiae Upsaliensis. Appendic. V. (Diss.). Upsaliae (1797). (Classes I-XIX).

Monographie af Urteslaegten Gorteria. Skrivt. Naturh. Selsk. Köbenhavn, Vol. IV: 2, tab. 1-6 (1798).—(Transl.: Monograph of the plant genus G.).
(Incl. species of *Gazania* (many), *Didelta*, *Cullumia*, *Hirpicium*).

Dissertatio botanica de Hydrocotyle. Upsaliae. Tab. (1798).
Reprint : in Diss. acad. Vpsaliae, etc., Vol. II, Gottingae 1800, tab. III.

Genera nova plantarum. Part. VIII. (Diss.) Upsaliae (1798).
Reprint : In Diss. acad. Vpsaliae, etc., Vol. I, Gottingae 1799.

Genera nova plantarum. Part. IX. (Diss.). Upsaliae (1798).

Museum naturalium Academiae Upsaliensis. Append. VII. (Diss.). Upsaliae (1798). (Classes I-XXIV).

Genera duo nova plantarum capensium. SCHRADER's Journal für Botanik, Göttingen, Vol. I, 1799 : 2.

Beskrivelse over sex Arter af Slaegten Rohria. Skrivt. Naturh. Selsk., Köbenhavn, Vol. I : 1, tab. VI-XI (1799).—(Transl. : Description of six species of the genus R.).
(All species belonging to the genera *Cullumia* and *Berkheya*).

Arctotis. (Diss.). Upsaliae (1799).
(Incl. species of *Ursinia* (many !), *Cryptostemma*, *Arctotheca*, *Haplocarpha*, *Didelta*, *Venidium*, *Chrysanthemum*).
Reprint : in Diss. acad. Vpsaliae, etc., Vol. II, Gottingae 1800.

Dissertationes academicae Vpsaliae habitae sub praesidio C. P. THUNBERG. Gottingae, Vol. I, tab. I-V (1799), edited by C. H. PERSOON.

Ibidem, Vol. II, tab. I-III (1800).

Prodromus Plantarum Capensium, etc. Pars posterior. Upsaliae (1800). (Classes XI-XXIV).

Oedmannia, et nytt Ört-slägte. K. Vet. Acad. Nya Handl., Stockholm, Vol. XXI, tab. IV (1800).—(Transl.: Oedmannia, a new genus of plants).
(=*Rafnia*, Thunb.).

Genera nova plantarum. Part. X-XII. (Diss.). Upsaliae (1800).

Museum naturalium Academiae Upsaliensis. Append. VIII. (Diss.). Upsaliae (1800).

Nova genera plantarum. Part. XIII-XVI. (Diss.). Upsaliae (1801).

Dissertatio botanica qua Aspalathus, etc. publico examini subjicitur. Pars I, II. (De Aspalatho). Upsaliae (1802).
(Incl. species of *Wiborgia* and *Argyrolobium*).

Dissertatio botanica de Blaeria. Upsaliae (1802).
(Incl. species of *Erica*).

Novae Species Plantarum Capensium, examinatae et descriptae. HOFFMANN's Phytographische Blätter, Göttingen, Vol. I (1803).

Dissertatio de Antholyza. Upsaliae (1803).
(Incl. species of *Babiana* and *Watsonia*).

Descriptiones nonnullarum Specierum plantarum, in Australis Africae Promontorio bonae spei sponte crescentium, quae antea vel non, vel incomplete, Botanicis innotuerunt. WEBER und MOHR,

Archiv für systematische Naturgeschichte, Leipzig, Vol. I: 1, tab. I (1804).

Description of such Species of Chironia as grow wild at the Cape of Good Hope. Trans. Linn. Soc., London, Vol. VII, tab. XII (1804).

Dissertatio de Phylica. Upsaliae (1804).

(Incl. species of two Bruniaceae: *Brunia* and *Staavia*).

Dissertatio de Brunia. Upsaliae (1804).

(Incl. species of *Berzelia* (many), *Staavia*, *Tittmannia*, *Nebelia*).

Plantae contortae in Promontorio bonae Spei Africes olim collectae jamquae descriptae. Nov. Act. Acad. scient. imper. Petropol., Vol. XIV, tab. IX (1805).

Hermas, plantae genus, descriptionibus, animadversionibus et iconibus illustratum. Ibid., Vol. XIV, tab. XI, XII (1805).

Celastri plures species, in Africae promontorio maxime australi collectae descriptaeque. RÖMER'S Archiv für Botanik, Leipzig, Vol. III: 3, tab. III (1805).

(Incl. species of *Euclea*, *Elaeodendron*, *Pterocetastrus*, *Dovyalis*).

Proteae, plantae generis, species novae, descriptae. Nov. Act. Acad. scient. imper. Petropol., Vol. XV, tab. III-VI (1806).

(Incl. species of *Leucadendron*, *Isopogon*, *Leucospermum*, *Serruria*).

E plantis Asperifoliis species nonnullae, vel omnino non, vel minus cognitae, in Promontorio bonae spei collectae et descriptae. SCHRADER'S Neues Journal für die Botanik, Erfurt, Vol. I: 3 (1806).

Thesium. (Diss.). Upsaliae (1806).

(Incl. species of *Colpoon* and *Thesidium*).

Museum naturalium Academiae Upsaliensis. Append. IX-XII. (Diss.). Upsaliae (1806).

Flora Capensis, sistens Plantas Promontorii Bonae Spei Africes, secundum Systema Sexuale emendatum redactas ad Classes, Ordines, Genera et Species, cum Differentiis specificis, Synonymis et Descriptionibus. Vol. I fasc. 1. Upsaliae (1807). (Contains the Classes I and II).

Reprint: See below.

Penaea illustrata. Magazin Gesellschaft naturf. Freunde, Berlin, Vol. I tab. III (1807).

(Incl. species of *Brachysiphon*, *Glischrocolla*, *Sarcocolla*, *Endonema*, *Geissoloma* (Geissolomaceae), and 1 Euphorbiacea: *Cluytia*).

Museum naturalium Academiae Upsaliensis. Append. XIV. (Diss.). Upsaliae (1807). (Classes XXIV, I-XIV).

Tillägg til Beskrifningen af Hydnora Africana. K. Vet. Acad. Nya Handl., Stockholm, Vol. XXIX, tab. VII (1808).—(Transl.: Additional notes on Hydnora Africana).

An illustration of the Species of Lycium which grow wild at the Cape of Good Hope. Trans. Linn. Soc., London, Vol. IX, tab. XIV-XVII (1808).

Museum naturalium Academiae Upsaliensis. Append. XVI. (Diss.). Upsaliae (1808). (Classes VI-XIX).

Galii species capenses, illustratae. Mémoires Acad. impér. sciences St. Pétersbourg, Vol. I, tab. VII-IX (1809).

Museum naturalium Academiae Upsaliensis. Append. XVII, XVIII. (Diss.). Upsaliae (1809).

Descriptiones Plantarum, e familia Orchidearum, in capite bonae spei Africes collectarum. WEBER'S Beiträge zur Naturkunde, Kiel, Vol. II (1810).

Beskrivelse over 19 Arter af Gladiolus fra Afrikas söndre Odde. Skrivt. Naturh. Selsk. Köbenhavn, Vol. VI, tab. I-IV (1810).—Transl.: Description of 19 species of Gladiolus from the southern Cape of Africa).

(Incl. species of *Lapeyrousia, Babiana, Acidanthera and Watsonia*).

Beskrivelse over de i Africa ved gode Haabs Forbierg fundne nye Arter af Convolvulus. Ibidem, Vol. VI, tab. III, V (1810).—(Transl.: Description of the new species of Convolvulus, found in Africa near the Cape of Good Hope).

(Incl. species of *Falckia* and *Ipomaea*).

Flora Capensis, etc. Vol. I fasc. 2. Upsaliae (1811). (Triandria: Monogynia).

The same edition, with a new title-page only: Hafniae 1820.

Dissertatio botanica de Borbonia. Upsaliae (1811). Tab.

(Incl. species of *Amphithalea* and *Rafnia*).

Poae capenses descriptae. Mémoires Société impériale des naturalistes, Moscou, Vol. III, tab. IV-VII (1812).

(Inel. species of *Eragrostis, Brizopyrum*).

Museum naturalium Academiae Upsaliensis. Append. XIX, XX. (Diss.). Upsaliae (1812).

Flora Capensis, etc. Vol. I fasc. 3. Upsaliae (1813). (Triandria: Digynia—Tetrandria).

The same edition, with a new title-page only: Hafniae 1820.

Campanulae capenses descriptae et depictae. Mémoires Acad. impér. sciences St. Pétersbourg, Vol. IV, tab. V-VII (1813).

(=species of *Wahlenbergia*, *Roella*, *Lightfootia*, *Microcodon*, *Prismatocarpus*).

Museum naturalium Academiae Upsaliensis. Append. XXI. (Diss.). Upsaliae (1813). (Lichenes).

Gladiolus Sparrmanni, ett nytt Species beskrifvet. K. Vet. Acad. Handl. för 1814. Stockholm. Tab. IX.—(Transl.: G. Sparrmanni, a new species described).

(=*Freesia Sparrmanni* (Thunb.) N. E. Br.).

Museum naturalium Academiae Upsaliensis. Append. XXII. (Diss.). Upsaliae (1814). (Classes XXIV, I-XVIII).

Museum naturalium Academiae Upsaliensis. Append. XXIII. (Diss.). Upsaliae (1816).

Genera plantarum Capensia Samolus, Trachelium, Polemonium, et Roella illustrata. Mémoires Soc. impér. naturalistes Moscou, Vol. V (1817).

(Trachelium=species of *Prismatocarpus*; Polemonium=species of *Retzia*; *Roella*, incl. 1 species of *Merciera*).

Rhamni capenses, tres novae species descriptae. Ibidem, Vol. V (1817).

(Incl. 1 species of *Scutia* and 1 species of *Cassine* (Celastr.).

Solana capensia, iconibus et descriptionibus illustrata. Ibidem, Vol. V (1817). Without tab.

Lobeliae capenses, descriptionibus et nonnullae iconibus illustratae. Ibidem, Vol. V (1817). Without tab.

(Incl. species of *Laurentia*, *Cyphia*, *Lightfootia*, *Grammatotheca*).

Graminum capensium species quatuor novae, descriptae. Ibidem, Vol. V (1817).

(=Alopecurus echinatus, Thunb.=*Lasiochloa ciliaris*, Kunth; Dactylis hispida, Thunb.=*Lasiochloa hispida*, (Thunb.) Kunth or *L. longifolia*, Kunth var. *hispida*, Stapf according to Stapf; *Ehrharta ramosa*, Thunb.: the fourth species we could not trace in Juel's "Plantae Thunbergianae").

Flora Capensis, etc. Volumen secundi. Fasciculum primum. Hafniae (1818). (Classis V).

(Second edition in 1820, see below).

Descriptiones quatuor Proteae novarum specierum. Mémoires Acad. imp. sciences St. Pétersbourg, Vol. VI, tab. XIV-XVII (1818).

(Protea coarctata, Thunb.=*Petrophila pulchella*, R. Br., an Australian sp.; Protea laevis, Thunb.=*Leucadendron imbricatum*, R. Br.; Protea ovata, Thunb.=*P. longiflora*, Lamk. and Protea plumigera, Thunb.=*Serruria simplicifolia*, (Poir.) R. Br.

Museum naturalium Academiae Upsaliensis. Append. XXV. (Diss.). Upsaliae (1818).

In genus Echitis observationes. (Diss.). Upsaliae (1819). Tab.
(Incl. species of the S. Afr. genera *Pachypodium*, *Ceropegia* and *Fockea*).

Museum naturalium Academiae Upsaliensis. Append. XXVI. (Diss.). Upsaliae (1819). (MDCCCIX—misprint for MDCCCXIX).

Flora Capensis, etc. Volumen secundi. Fasciculum secundum. Hafniae (1820). (Classes VI, VII).
Both fascicles together with a new title-page: Volumen secundum. Hafniae 1820.

Flora Capensis, etc. Edidit et praefatus est I. A. SCHULTES. Stuttgardtiae (1823). The only complete edition.

Flora Capensis, etc. Vol. I. Editio nova. Hafniae (1824). This is a reprint, comprising only the two first fascicles, Monandria—Trandria: Monogynia; the first part of the preface has been omitted.

Plantarum capensium species novae. I-III. (Diss.). Upsaliae (1824).

Plantarum capensium species novae. IV.—Genera plantarum nova indica.—Species Orientalis Indiae novae. (Diss.). Upsaliae (1824).

CONCLUSION.

It was not till the third part of this work had been printed, that we were fortunate enough to secure a copy of MACOWAN's delightful paper "Personalia of Botanical Collectors at the Cape" (1887), re-published by VERDUYN DEN BOER in 1929[220]. The many interesting records MACOWAN was able to collect in this essay which originally was his presidential address delivered at the meeting of the South African Philosophical Society, July 1886, combined with his sparkling style, made it fascinating reading from the first to the last page.

As to THUNBERG this publication provides some little known data which we are only too glad to add to our work, since they tell us something about the last part of his long and active life, at the same time elucidating his remarkable personality.

[220] *Vide* footnote 197. We traced two incorrect dates in the information given about THUNBERG. It was not in March, 1789, that he reached his native land after his long journey, but in March, 1779. And the date of his decease was August 8, 1828 and not 1826. No doubt these are misprints which are likely not to be found in the original edition of MACOWAN's paper.

It seems that life went very smoothly for THUNBERG after he had become a professor of botany in succession to LINNAEUS the younger who died in 1783. He remained at Uppsala teaching daily and supervising the Botanic Garden for many years, "secure in the respect and esteem of the little world at Upsala, and the honour of scientific men everywhere", as MACOWAN puts it.

THUNBERG must have been somewhat the type of an old-fashioned professor, so often pictured in humoristic papers. Apparently he did not care much for his personal appearance, for MACOWAN narrates that he could not be persuaded to alter in any way the fashion of his attire so as to follow the custom of the day. Nothing could prevent him from delivering his daily lecture even when in his eightieth year, but he would daily drive in from his country house Thunaberg in a very old and creaky carriage "as ancient as the fashion of his clothes" and which the students nicknamed "skällerormen", which means rattle-trap.

When examining the collection of Linneana in the library of the Royal Zoological Institution "Natura Artis Magistra" at Amsterdam, we stumbled upon a biography of THUNBERG which was hitherto unknown to us. It has been originally published by C. A. AGARDH in the Kongl. Vetenskaps Academiens Handlingar of 1828[221] and must be considered as the most reliable biographical account written of this gifted botanist by a contemporary.

The picture THUNBERG's biographer gives of his character is of the briefest kind, but nevertheless very eulogistic. As THUNBERG was "as artless as nature," his character could be summarized in a few words only, viz.: "The characteristic of his soul was joy, of his outward bearing liveliness, and of his social intercourse friendliness." His

[221] Kongl. Vetenskaps Academiens Handlingar för år 1828—Stockholm 1829 (Transactions of the Royal Academy of Science); containing THUNBERG's biography and a complete summary of his scientific publications, further some biographical accounts of other distinguished learned men Sweden lost in the year 1828. The biographical account of THUNBERG is written by the elder AGARDH, CARL ADOLF (1785-1859), naturalist, state economist and theologian, first professor of botany at Lund, afterwards bishop at Karlsbad, the famous "father of Algology." AGARDH succeeded THUNBERG in the Swedish Academy of Science and this little biography was his speech in commemoration of his predecessor. Some of these speeches were afterwards translated into German. The little book we consulted was a German translation by Dr. GOTTLIEB MOHNIKE of two of these biographies, viz.: *Die Schwedischen Naturforscher* KARL PETER THUNBERG *und* JOHANN WILHELM DALMAN. Aus den Abhandlungen der Königlichen Akademie der Wissenschaften zu Stockholm. Stralsund, 1831. As an appendix to this work Dr. MOHNIKE has added a translation of some biographical records of THUNBERG, of an extensive report of THUNBERG's funeral, and of two poems, which all had appeared at the time in Swedish papers. In those poems, originally published in the Stockholm magazine "Journalen" of 1828 (No. 197. Upsala), the students from the province of Småland, whose supervisor Prof. THUNBERG had been for rather more than 39 years, lamented the loss that the country, the sciences and they themselves had suffered.

biographer continues by saying that there is no need to add anything to this, for there cannot be given a more faithful picture of THUNBERG than by these three substantives.

In 1784 THUNBERG married BRIGITTA CHARLOTTA, daughter of the academical administrator RUDA. Their marriage remained childless and in 1813 his wife passed away.

When he had reached the age of 84, he handed over his duty as lecturer to his foster-son Dr. FORSBERG[222], reserving still to himself the curatorship of the Museum. In the summer of 1828, when suffering from a slight feverish attack, he felt his end drawing near. He was placed at his request in a carriage and gently driven over to Uppsala and round all his favourite walks in the Botanic Garden, " taking his farewell view of the objects which had been so dear to him throughout a long life." He died a few days later on August 8, 1828, in his country-house Thunaberg, at the age of eighty-five. His funeral at Uppsala on the 17th of that month was attended by an immense crowd of students and citizens of every degree.

So THUNBERG kept up his incredible energy nearly to the day that his mortal life came to an end.

During his long and active life THUNBERG received much homage. He had been made a Knight of the Royal Order of Vasa in 1785[223], and in 1815 he became a Commander of the same Order, a honour that hitherto had not been conferred by the King on any academical teacher in Sweden.

In his day he was the only scientist with European fame among the professors at the University of Uppsala. He was a member of no less than sixty-six academies and learned societies at home and abroad, of which may be mentioned here : The Kongl. Vetenskaps Academien (R. Acad. of

[222] CARL PEHR FORSBERG, born at Jönköping, February 1, 1793, and deceased at Carlsborg, April 20, 1832, was a medical doctor and a direct descendant from the second marriage, in 1753, of THUNBERG'S mother with the merchant GABRIEL FORSBERG. In this marriage C. P. FORSBERG'S father, the merchant HÅKAN LORENZ FORSBERG who consequently became THUNBERG'S half-brother, was born. Young C. P. FORSBERG went to Uppsala in 1803 and there he lived in THUNBERG'S home and was treated as his son. MACOWAN in his " Personalia of Botan. Coll. at the Cape," 1887 (new edit. 1929, p. 39) has erroneously stated Dr. FORSBERG to be THUNBERG'S stepson instead of foster-son.

It was by THUNBERG'S last will that Dr. FORSBERG should obtain his extensive insect-collection in order to arrange the specimens, in which work he had not satisfactorily succeeded himself. Having done so, FORSBERG had to deliver the collection to Uppsala University.

FORSBERG'S only botanical publication is a 9 pages paper on the Swedish Campanulas (" De Campanulis Suecanis," Upsaliae, typ. Palmblad, 1829).

[223] *Vide* C. P. Thunberg II, Journ. of S. Afr. Botany, Vol. V, Part III, July, 1939, p. 100. From the Author's preface, p. xlviii, of " Voyages de C. P. Thunberg," tome I (Paris, 1796) it may be quoted that THUNBERG was accorded the R. Order of Vasa on November 21, 1785.

Science), the Kongl. Sundhets-Collegium (R. Health Board) of which he was a honorary member, and the Svenska Läkare Sällskapets (Swedish Society of Surgeons), all at Stockholm ; the Royal Norwegian Society of Sciences at Drontheim ; the Societas Linneana, the Societas Medica, the Medico-Botanical Society, the Societas Regia pro Scientia naturali promovenda, the Societas pro Scientia Horticulturae promovenda, all in London ; the Societas Naturae Studiosorum and the Societas Medica at Edinburgh ; the Hollandsche Maatschappij der Wetenschappen (Dutch Society of Sciences) at Haarlem ; the Zeeuwsche Genootschap der Wetenschappen (Zealand Institution of Sciences) at Flushing ; the Societas Scientiarum and the Institut Royale des Sciences, de Littérature et des beaux Arts at Amsterdam ; the Societas Scientiarum Bataviae Indiae Orientalis ; the American Philosophical Society at Philadelphia ; the Academia Imperialis Leopoldino-Carolina Naturae Curiosorum at Bonn ; the Societas Physica at Göttingen, idem at Zürich ; the Societas Phytographica at Göttingen ; the Gesellschaft der Naturforschenden Freunde in Berlin ; the Academie Royale des Scienees de l'Institut de France (correspondent) ; the Société Royale des Sciences at Montpellier ; the Société d'Histoire Naturelle, the Société Médicale, the Société Linnéenne, all in Paris ; the Academia Caesarea Scientiarum at Petersburg ; the Société des Naturalistes at Moscow ; the Academia dè Georgofili at Florence.

On three occasions medals were struck in his honour[224]. In 1818, on his 75th birthday, a gold medal was struck by the " Smålands Nation " (Småland student society) at Uppsala, of which he had been the supervisor for many years. After his death two memorial medals were struck by the Swedish Academy of Science (Kungl. Vetenskapsakademien) at Stockholm. The medal issued in 1832 shows on the one side his portrait and on the other the flower goddess Flora with a *Thunbergia* in her hand and the inscription " Suis late Regina Triumphis " (" She rules far and wide by her Victories "). The other medal struck by the Academy in 1907, gives the effigy of Thunberg on one side, whilst the other side shows a wreath of *Thunbergia* framing the inscription " E tot floribus sibi famae florem habet ", and underneath " Peregrinator assiduus stud. bot. fines dilatavit ", which reads in English translation : " Out of many flowers he has for himself the flower of glory " (*Thunbergia* !) and " The assiduous traveller has widened the boundaries of botanical study."

[224] Nils Svedelius, " Carl Peter Thunberg 1743-1828," Svenska Linné-Sällskapets Årsskrift, Argång XXVII (1944), pp. 61-62 ; *ibid.*, " C.P. Thunberg on his Bicentenary," in the American journal Isis, Vol. XXXV, Part 2, No. 100, Spring, 1944, p. 133.

Mention should also be made that THUNBERG received very attractive and most honourable offers from foreign countries. Prof. DAVID VAN ROYEN at Leyden, for instance, tried to persuade him to come to Holland in order to become his successor as a professor of botany and medicine at Leyden's famous University ; and in 1802 the Imperial Russian Academy of Science offered him the Academy's membership and the post of director of the large and well-provided botanical garden at Petersburg. But preferring to serve his own country, THUNBERG declined any offer of work outside Sweden.

We owe to THUNBERG the discovery and introduction into Europe of a very great number of Cape plants, an endless series of the most beautiful and the most curious representatives of a vegetation whose variety can hardly be equalled by any other flora on the face of the earth. THUNBERG himself must have been greatly impressed by the strangeness of the plants he came across on his botanical peregrinations. The following summary of the features of the Cape flora given by him in the Preface of his paper on *Hydnora capensis* (K. Vet. Acad. Handl., 1775) is self-evident : " The herbs are as much unlike all others on the globe as the country itself is separated from the rest of the world."[225].

The importance of THUNBERG'S botanical activities at the Cape has been summarized by MACOWAN[226] in these few words of appreciation : " Nevertheless, as long as in our paradise of flowers there wanders a single botanist, so long will the name of THUNBERG be held in honoured remembrance." And so it is.

His name is commemorated in the African and Asiatic genus *Thunbergia*. This genus, belonging to the Acanthaceae and including some graceful climbers with bright flowers (*T. alata* !), was named after him by his fellow-countryman ANDERS JAHAN RETZIUS, Botanical Demonstrator at Lund (Lunds Fysiografiska Sällskaps Handl., 1780).

In the foregoing pages we have made an earnest attempt to elucidate the prominent part THUNBERG played in the early investigation of Cape botany. In the long and noble procession of learned men who occupied themselves with the exploration and study of the Cape flora, THUNBERG may be regarded as one of the most brilliant figures ; he was a pioneer whose merits can hardly be overrated.

We know that before the last world-war scientific institutions in Sweden and South Africa were planning the erection of a " Thunberg

[225] Original Swedish text : " Örterne äro så olike alle andre i verlden som sjelfve Landet är skildt från gemenskap med den öfrige världen."

[226] PETER MACOWAN, " Personalia of Botanical Collectors at the Cape," Transact. S. Afr. Phil. Soc., Vol. IV, 1887. New edit. (VERDUYN DEN BOER) 1929, p. 40.

Memorial " at Kirstenbosch. It is our sincere hope that the day may come when both countries, united in mutual appreciation, will commemorate Carl Peter Thunberg, the illustrious Swedish scientist and *Father of Cape Botany*, by erecting a monument to him under the blue South African sky on the historical soil of Kirstenbosch, the site of the National Botanical Gardens. This would certainly be warmly welcomed not merely by his panegyrists, but by everyone who loves our wonderful Cape plants, so many of which are linked with the name of that outstanding Swedish botanist and collector.

ADDENDA ET CORRIGENDA.

To Carl Peter Thunberg I, Journ. of S. Afr. Botany, Vol. V, Part I, January, 1939 :

P.2—We may add here that his father Johan Thunberg, who was a mine book-keeper and in addition to this carried on a small business, early expired and left his wife and children without means. Although later on things improved by the second marriage of his mother, Margaretha Starkman, with the merchant Gabriel Forsberg, young Thunberg was still in a position not unusual for Sweden, where often witty and brilliant men had to struggle for life in their youth (Kongl. Vetensk. Acad. Handl. 1828).

Plate I, portrait of Thunberg. The litho by Cardon was not made from the original painting by Per Krafft the younger, but from a copy of it which is now in the house of the students of " Smålands Nation " at Uppsala. The original painting was made in 1808, when Thunberg was at the age of 65, and is a good likeness according to his biographer (C. A. Agardh) in the Kongl. Vetensk. Acad. Handl. of 1828. It belongs to the University of Uppsala and is now in the Faculty of Medicine.

P. 3—read : " The capital Yeddo (the later Tokyo)", instead of " the then capital Yeddo ", which would suggest that Yeddo is not the capital of Japan any more, while it has only changed its name.

P. 5—read : " . . . . sent to Thunberg when he was in Paris in order to complete his *medical* studies ", instead of " botanical " studies.

Pp. 5-6—By some oversight Rumphius' Herbarium Amboinense and the " Flora of Ceylon " have been wrongly ascribed to N. L. Burman. His father Jan Burman was the author of both publications, which is also clearly shown by the dates of issue : the first work was published from 1741-1755, the latter (Thesaurus zeylanicus) in 1737.

While translating N. L. BURMAN's letter to THUNBERG of August 30, 1773, we have overlooked the little word " vix " (see footnote 2, third line from above) and in consequence of this our translation of the passage (p. 6) gives the opposite of BURMAN's meaning. As a matter of fact BURMAN wished to receive from THUNBERG living plants of those species which can *hardly* (vix) be propagated by seeds. The words " interque illas " (second line of footnote 2), which literally mean " among those," have been erroneously translated by " among other things," which may be replaced in this connection by " those." The passage in question when corrected reads as follows :

" You will greatly satisfy the Directors of the Hortus if you would send to the Hortus a box, filled with living plants, and would select those such as can hardly be propagated by seeds, like Geranium spinosum, flavum, etc."

P. 9—We may add here that the family records of the BURMANS have been taken from : " Notices historiques et généalogiques sur la Famille BURMAN," par J. G. BURMAN-BECKER. Copenhague, Imprimerie de E. C. Löser (without year).

One may find it of interest to know that there is a direct descendant of the BURMANS in the person of the distinguished Swiss scientist Dr. JAMES BURMANN, for which information we are indebted to Prof. Dr. TH. J. STOMPS, recently retired from his office as a professor of botany at Amsterdam University. Dr. BURMANN who lives at Geneva, is a man of great merits in the field of pharmacology and chemistry ; for his important research-work he is honoured at home and abroad. A worthy descendant of his famous ancestors !

P. 23—read : " BANKS *encouraged* the founding of the Linnean Society of London," instead of " was one of the founders." He may have kept himself aside because of his position as a president of the Royal Society.

To Carl Peter Thunberg II, Journ. of S. Afr. Botany, Vol. V, Part II, July, 1939 :

Plate 10, facsimile of CAROLUS LINNAEUS' handwriting, should face p. 89 instead of p. 94.

P. 92—We have been kindly informed by Dr. J. D. RUYS of Dedemsvaart, director of " Moerheim," the largest nursery of hardy perennials in Holland, that the estate " Ekebyhof " on a little island in lake Mälaren near Stockholm, owned at the time by the Royal Secretary ALBERT IHRE, BÄCK's son-in-law, is still inhabited by the IHRE family. Some time before the last world-war, being on a business-tour in Sweden, Dr.

Ruys visited the present owner of "Ekebyhof," cavalry captain Ihre, who has established a nursery on his estate.

P. 99—In the translation of Bengt Bergius' letter of December 18, 1781, to Thunberg, following slight alteration should be made: "He (Scheffer) seemed to be sincere in this, moreover he *agreed* that Linné was not useful at Upsala," instead of "was of the opinion" Linné etc. It seems that Bergius had uttered his opinion in this direction and that Scheffer then said that he thought he was right.

To Carl Peter Thunberg III (Travels), Journ. of S. Afr. Botany, Vol. V, Part III, October, 1939:

On p. 106 mention is made of 3 plates, illustrating Vol. I of Thunberg's "Travels." Of the two plates inserted at the back of the volume, one represents the "*Marmota Africana*," called in this work the great white Cape mole. We lately examined a copy of the French edition, *Voyages de* C. P. Thunberg *au Japon, par le Cap de Bonne-Espérance, des îles de la Sonde*, etc. (translated by L. Langlès and revised by J. B. Lamarck as far as the scientific part is concerned). Vols. I-IV. Paris 1796. Vol. IV of this translation contains the same strange picture of the "Marmota Africana" (Hyrax capensis of Schreberg) which is far from resembling a mole, largely because of its distinct teeth which are those of a rodent. Prof. Lamarck observes in Vol. I, pp. 318-319, that this animal is a true marmot, as also thought by Thunberg who informs us about this animal that it preferably feeds on the corms of Gladiolus, Antholyza, Ixia and "Iris" (p. 320). According to Lamarck the correct scientific name of "la marmotte d'Afrique", as this rodent is called by him, is *Mus maritimus*, Gmel. (p. 319).

P. 110, footnote 48 about Sparrman—read: "Back in Sweden, he became a keeper of the natural history collections in the possession of the Academy of Science (1778-1798) and was appointed professor of natural history and pharmacology at *Stockholm* (not Uppsala!) in 1790. Although there did not exist any university at the time, a professorship was combined with the Board of Physicians."

P. 113—following record of Thunberg's excursion to Mount Paarl, in the company of Dr. Le Sueur, quoted from "Travels," Vol. I (1795), p. 122, should be inserted at the foot of the page: "The land in these parts was very poor, being merely loose sand, under which lay the solid rock, consisting of brown ferruginous clumps, composed of clay, vitriolic acid, and slate. In these meagre plains, nevertheless, *phylicas*, *ericas*, and *Proteas*, grew in abundance."

P. 118, footnote 64—read : Iris edulis, Thunb.=*Morea edulis*, (Thunb.) L.f. (according to N. E. Brown in Linnean Soc. Journ.—Botany, Vol. xlviii, April, 1928 : " S. Afr. Iridaceae of Thunberg's Herbarium ").

P. 128—Between the first and second paragraph should be inserted : On the 14th of December (1772) Thunberg was at a farm near Slange River (Oudtshoorn Division), of which he writes : " Here we saw quickset hedges of *Aloe succotrina*."

P. 129, footnote 108 about " Fucus buccinalis "—read : " This plant, a very common sea-weed, and one of the larger thalloid forms, was later named *Ecklonia maxima*, (Osbeck) Papenf." (instead of Ecklonia buccinalis). It belongs to the Laminariaceae.

P. 130, footnote 117—read : *Tulbaghia alliacea*, L.f. (not L. !).

P. 132, footnote 123—read : Gladiolus recurvus, Thunb.=*Hesperantha recurva*, Ascherson et Graebner (according to N. E. Brown in Linn. Soc. Journ.—Botany, Vol. xlviii, 1928) ; the same page, footnote 125—read : Antholyza ringens, L.=*Babiana ringens*, (L.) Ker.

P. 133, footnote 133—read : Asclepias undulata, L.=*Xysmalobium undulatum*, (L.) R. Br.

P. 135—Alluding to the financial difficulties Thunberg had to cope with during his time at the Cape, he openly testifies in his preface to the " Flora Capensis ": "*Ingenue enim fateri non erubescam, pauperiorem Florum Amorem numquam peregrinasse, numquam ardentiori Zelo fuisse accensum* " (" Without a blush I frankly confess that there never can have been a more impecunious lover of flowers out on travels of exploration than I, yet never one more glowingly enthusiastic ").

P. 149—The species of *Aloe* Thunberg discovered when climbing Bokkeveld Mountain, was first described and named *A. dichotoma* by *Francis Masson*, not by Linnaeus *filius* as quoted here.

P. 151—insert at the head of the page, above *Roggeveld Mountains*, following note about the Lowermost Roggeveld, quoted from " Travels," Vol. II (1796), p. 168 : " The whole country is destitute of wood, and has only a few small shrubs and bushes of the Mesembryanthemum, Pteronia, Stoebe kinds, and a few others, such as Othonnas, &c. The country produces good fodder for sheep and horses only, of which there are great numbers, but very little horned-cattle, on most of the farms." On the same page, footnote 191, read : Karré-hout, *Rhus viminale*, Ait.

P. 154, footnote 195 and J. Dryander : He succeeded Solander as librarian of Sir Joseph Banks and of the Linnean Society. In order to avoid the impression that Solander had been the Society's librarian before—the Linnean Society having been founded only after his death—we ought to put in the words : " . . . . and *was also librarian* of the Linnean Society."

PRODROMUS

PLANTARUM CAPENSIUM,

QUAS,

IN

PROMONTORIO

BONÆ SPEI AFRICES,

ANNIS 1772—1775,

COLLEGIT

CAROL. PET. THUNBERG.

PARS PRIOR.

UPSALIÆ,

LITTERIS VIDUÆ DIRECT. JOH. EDMAN, 1794.

Title-page of C. P. Thunberg,
Prodromus Plantarum Capensium.
Vol. I, Upsaliae, Litteris viduae Direct. Joh. Edman, 1794.

CAROL. PET. THUNBERG,
Equ. Reg. Ord. Wasæi, Med. et Bot. Prof.
Acad. et Societ. Litt. XL
Membr. et Corresp.

FLORA CAPENSIS,

sistens

Plantas Promontorii Bonæ Spei Africes,

secundum

Systema Sexuale emendatum

redactas ad

Classes, Ordines, Genera et Species,

cum

Differentiis specificis, Synonymis et Descriptionibus.

Volumen Primum.

UPSALIÆ, MDCCCVII.
Litteris JOH. FR. EDMAN, Reg. Acad. Typogr.

Title-page of C. P. Thunberg,
Flora Capensis.
Vol. I, Upsaliae, 1807. Litteris Joh. Fr. Edman, Reg. Acad. Typogr.

Photographs taken of copies of these works in the Herbarium of the Royal Botanic Gardens, Kew, England.

INDEX OF PLANT NAMES.